LONDON AND DUBLIN, &c. COMMUNICATION.

RETURN to an ORDER of the Honourable The House of Commons,
dated 15 April 1840;—*for*,

COPY of the FIRST REPORT of the COMMITTEE appointed by the Lords of the Treasury, in pursuance of Addresses of The House of Commons of the 12th, 14th, and 20th August 1839;—and of a REPORT from Rear-Admiral Sir *James A. Gordon* and Captain *Beechey* to the Lords of the Admiralty, relative to the best Means of communicating between *London* and *Dublin*, and the relative Capabilities of the Ports of *Holyhead*, *Ormes Bay*, and *Portdynllaen*.

(*Mr. Robert Gordon.*)

Ordered, by The House of Commons, *to be Printed*,
15 *April* 1840.

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Under 12 *oz*.

REPORT from Lieutenant-Colonel Sir Frederic Smith, of the Royal Engineers, and Professor Barlow - - - - - - p. 3

REPORT from Rear-Admiral Sir J. A. Gordon and Captain Beechey, of the Royal Navy - - - - - - - - - p. 39

PLANS.

1.—PLAN showing the Line of the Great Holyhead Railway through Chester, uniting with the Chester and Birkenhead and Chester and Crewe Railways, and of the proposed Junction of the Ormes Head Line with the Chester and Crewe Railway at Rowton.

2.—Diagram referred to in page 42.

3.—MAP showing the Proposed Lines of Railway Communication between London and Dublin.

FIRST REPORT of the COMMITTEE appointed by the Lords of the Treasury, in pursuance of the Addresses of the House of Commons of the 12th, 14th, and 20th August 1839.

Railway Committee Office, 5 Committee-Room,
House of Commons, 16 April 1840.

Sir,

WE have the honour to acquaint you, for the information of the Lords Commissioners of the Treasury, that on the receipt of their Lordships' instructions, dated the 26th November 1839, in which we are directed, in pursuance of the Addresses of the House of Commons, dated the 12th, 14th, and 20th August last, to inquire into and report upon the surveyed and projected lines of railway therein mentioned, we lost no time in entering on the performance of the duty assigned to us.

We communicated with the engineers, or other parties who, we had reason to believe, were promoters of, or interested in, the lines alluded to, and we devoted our earliest attention to the consideration of the communication between London and Dublin, which forms the subject of the Address of the 12th August last.

Instructions.

This Address prays "that Her Majesty will be pleased to give directions that an engineer or engineers may be appointed to inquire and report upon the relative merits, and the preference which ought to be given to the respective already-surveyed and projected railways following: namely, from Holyhead, *viâ* Bangor and Chester; Portdynllaen, *viâ* Caernarvon, Bangor, and Chester; Portdynllaen, *viâ* Barmouth, Bala, and Shrewsbury; Orme's Head, *viâ* Chester:" and also, "that Her Majesty will be pleased to give directions that proper persons may be appointed to inquire and report upon the best means of communication by sea between Dublin and London, as connected with the said intended railways."

We have to observe, that for the route by Chester to Holyhead there are two projects; one of which is recommended by Mr. George Stephenson, civil engineer, and the other by Mr. Giles, civil engineer.

One line only has been proposed to Orme's Head, and this has been brought forward by Mr. Jenkins, civil engineer.

The three above-named gentlemen submitted to us such plans, sections, and reports of their lines as we considered would be sufficient to enable us to decide on their relative merits, after an examination of the country through which it is proposed that they should pass.

It appears that Mr. Vignoles and Mr. Rastrick were the civil engineers employed to make surveys for a railway leading from Portdynllaen towards London, and the former gentleman reported the result of these researches to the commissioners for the proposed lines of railway in Ireland, which is published in the Appendix of their Report. Mr. Vignoles there gives it as his opinion that the best line for a railway from Portdynllaen is by Pwllheli, Tremadoc, Harlech, Barmouth, Dolgelly, Drews-y-nant, Bala, and Shrewsbury.

See Appx. (C.)

He attached to his report a tracing of this line, on a map compiled from the Ordnance map of North Wales, and he also supplied a detailed section of it from Portdynllaen as far as Bala; but beyond that point there is nothing definite to guide us, as to Mr. Vignoles's project.

Mr. George Stephenson states, in his printed report to the directors of the Chester and Crewe Railway (a copy of which was laid before us), that he has more recently had the country between Portdynllaen and Bala surveyed, keeping nearly in the track pointed out in the report of Mr. Vignoles; and of this survey, which Mr. Stephenson extended to Chirk, 30 miles beyond Bala, he has given both a section and a verbal description.

It appears that a line was surveyed between Wolverhampton and Shrewsbury, on which Mr. Locke has made a report. A copy of this report was forwarded to us, but we do not learn that any survey has hitherto been made for determining the best line between Shrewsbury and Chirk, so that the project for a railway communication between London and Portdynllaen, by the route recommended by Mr. Vignoles, is apparently still incomplete.

Of

Of the line from Portdynllaen to Bangor, we were not enabled to procure any plans or sections previously to our commencing the inspection of this part of the country; and until our reaching Chester, where Mr. Henry Archer acquainted us that he is a promoter of this line, we were not aware that it was likely to be supported.

We shall, in a subsequent part of this Report, give the result of our further communications with Mr. Archer, and shall now proceed to describe the proposed lines by the northern coast of Wales.

Having signified to the engineers concerned our intention of examining their lines, we left London on the 30th of December and proceeded to Chester.

At that place we were met by Mr. George Stephenson and Mr. Jenkins, and these gentlemen, with Mr. Gladstone and Mr. Palin (who had surveyed Mr. Stephenson's line), accompanied us in the examination of the country, to point out their respective routes; but Mr. Giles and Mr. Vignoles did not join us in our investigation.

Mr. Vignoles acquainted us, that he had no information to supply beyond that which is to be found in the Report of the Irish Railway Commission, and he referred us to a letter, dated the 17th August last, addressed by him to the Lords of the Treasury, in which he states, "that any comparison drawn from the result of exploring surveys, levels, and researches, as far as they have hitherto been carried along the Portdynllaen and Bala line, with the result of the detailed surveys and sections made on the Holyhead and Chester line, would be deceptive, and that no truly correct professional conclusions of an unbiassed judgment can be drawn from such unequal examinations." Mr. Vignoles concludes the letter in question with the following paragraph: "At the risk of being considered presumptuous, I would most earnestly represent to the Lords Commissioners, that notwithstanding the reports made in favour of the Holyhead and Chester route, I am still of opinion that the line from Portdynllaen by Bala and Shrewsbury, or a modification thereof, would, upon a full and detailed and impartial investigation, be found the most desirable, in reference to the numerous collateral circumstances, and to the general public results; and at the same time, I beg to be permitted to record my deliberate professional opinion, that it can only be from minute surveys, on a sufficiently large scale, and upon accurate location, that a proper judgment can be formed, or one which ought to sway with Her Majesty's Government or with the Legislature, in deciding upon the relative merits and the preference which ought to be given to the respective lines of railway stated in the Commons' Address to Her Majesty. It is true that to obtain such detailed investigation to the requisite extent would be attended with some expense, which to some might be deemed considerable in the abstract; but I do most urgently submit, that such expenditure should be regarded as but a trifle in comparison with the magnitude and importance of the object, and that such a consideration ought not to impede the sufficient and satisfactory inquiry which ought to precede the ultimate decision on this subject; but I apprehend, that in the event of such detailed examination and surveys being made, they may all by proper arrangement and system, on the part of the directing engineer, and of the surveyors, in recording their operations on a large scale, be made available for the ultimate laying out and construction of the railway, and would be most valuable documents to the parties who might ultimately have to execute them, and upon whom the expense might, with the utmost propriety, be eventually thrown."

We here think it right to remark, that had there seemed to us, after an inspection of the country, any ground for supposing that a line more easy of execution than that from Chester to Holyhead was to be found between Portdynllaen and Shrewsbury, by the Bala Pass, which Mr. Vignoles has stated to be the lowest in this part of North Wales, or had there appeared statistical reasons for preferring the Inland line, we might have felt the propriety of pressing upon the consideration of their Lordships the foregoing suggestion of Mr. Vignoles, but we have seen no cause for so departing from the strict letter of our instructions.

Indeed, with the exception of some minor details, which do not affect the general bearings of the case, the line selected is perhaps the best that the difficult tract of country which forms the Bala Pass affords, and is such as might have been expected from the skill and experience of those gentlemen who directed the surveys; and whatever may be the objections which in a subsequent part of this Report we shall have to make to this line, they will apply to defects that were not within the power of the projectors to remedy.

Examination of the Lines to Holyhead and Orme's Head.

Owing to the nature of the country, the lines of Mr. Stephenson, Mr. Giles, and Mr. Jenkins are for many miles nearly identical, and therefore, as we believe that the report given in by Mr. Stephenson details with great accuracy the nature of the work he proposes, we shall append it to this Report, as the best description which it is in our power to offer of his line, and we shall now only touch on some of its most important features, and notice the points of difference between it and the lines of the other engineers. See Appx. (B.)

The three lines commence at different points, and, gradually approaching each other, meet about midway between Chester and the Upper Ferry. In order to dismiss this part of the subject, we will here state, that Mr. Giles's line commences in the Crewe and Chester line, at about three miles from Chester, and crossing the Dee by a viaduct of masonry, arrives, without any severe inclination, at the Upper Ferry about one mile beyond Chester. See Plan, No. 1.

Mr. Jenkins's terminus is likewise to be on the Crewe and Chester line, at about two and a half miles from Chester. He proposes, also, to cross the Dee above the city, on a masonry viaduct, and descend towards the Upper Ferry, commencing by a fall of three-quarters of a mile in length, at the rate of one in 97.

The terminus selected by Mr. Stephenson is that of the Chester and Crewe and the Chester and Birkenhead Railways.

The construction of that part of his line which would intervene between his terminus and the Upper Ferry, would, in proportion to its length, be attended with more expense than the construction of either of the other lines to the same point, as will appear from the following description; but it is to be observed, that in this course there would be about one mile less of new line to construct, although it would increase the total distance from London.

Proceeding from the Chester station of the Chester and Crewe, and the Chester and Birkenhead Railways, Mr. Stephenson proposes to pass at right angles under Northgate-street, by a tunnel, in red sand-stone rock, of 220 yards in length, and to cross the canal and the River Dee by viaducts; the latter, which would be 30 feet above high-water mark, he proposes to place below the bridges, but in a position that it is supposed will not interfere with the navigation.

With the single exception of passing through Chester, we are of opinion that Mr. Stephenson's line may be executed as economically as either of the other lines, to the point where Mr. Jenkins's line diverges towards Orme's Head, which is about 40 miles from Chester.

From thence, the projects of Messrs. Stephenson and Giles alone are in competition; and we may here remark, that where these two lines differ, the line of Mr. Stephenson would, in our opinion, be generally executed at a smaller cost than that of Mr. Giles.

Between the point where the three lines almost come in contact, near Chester, and that where Mr. Jenkins's line branches off to Orme's Head, as above alluded to, the country is extremely favourable for the construction of a railway; and, with the exception of Penman Rhos, there is scarcely a difficulty for the engineer to overcome. At this promontory, Messrs. Giles and Jenkins propose a tunnel, of 350 yards in length, and Mr. Stephenson one of 330 yards. Up to this point, which is between 38 and 40 miles from Chester, there are no less than 35 miles of level, and for a great portion of this distance the railway would be nearly on the natural surface of the ground.

The next point requiring observation is the passage of the Conway River, and the line through the town. Both Mr. Stephenson and Mr. Giles propose to form an embankment parallel to that which has been constructed for the turnpike road, and to erect a bridge for the railway, a little higher up the river than the suspension bridge.

Mr. Giles does not inform us how he proposes to pass through the town, but we learn from the report of Mr. Stephenson, and this gentleman also pointed out to us on the ground, that his own line passes under Rosemary-lane and Upper Gate-street, and through the town walls, a short distance to the southward of the turnpike road.

The difficulties that might have been apprehended at this point, either do not exist or may easily be overcome, and the two lines may be carried on without requiring any work of importance until they reach Penman Bach.

It is proposed to pass through this headland by tunnels; that of Mr. Giles being 1,408 yards in length, and that of Mr. Stephenson only 500 yards.

From hence the work presents no difficulty until the lines reach Penman Mawr, which is about 54 miles from Chester.

Mr. Stephenson proposes to pass round this promontory, below the level of the turnpike road, protecting the railway by a sea-wall. Mr. Giles, on the other hand, recommends going through the rock by a tunnel of 1,628 yards in length. It appears to us, that as Penman Mawr is in the clay-slate formation, the latter would be a much more expensive and formidable operation than the sea-wall, and we therefore have no hesitation in stating that the mode proposed by Mr. Stephenson of passing this headland is preferable to that suggested by Mr. Giles.

From Penman Mawr the lines follow a course in which there is not any essential difference until they reach the corner of Penrhyn Park.

Here Mr. Stephenson proposes to pass under the turnpike road; then over the River Ogwen, by a bridge 37 feet high, with embanked approaches, and afterwards through a cutting five-eighths of a mile long, and 45 feet deep.

The line then crosses the River Cagen and the valley through which it runs, by a short viaduct, and an embankment 350 yards long, the extreme height of the former being 75 feet; this brings it to the ridge on the east side of Bangor. By cutting a tunnel of 490 yards in length through this ridge, the line would open on the Bangor valley, and pass Castle-street by a viaduct 35 feet high and 125 feet long. It would then cross the valley by an embankment and viaduct of a quarter of a mile in length, and of the extreme height of 70 feet. Mr. Stephenson proposes to pass through the hill of Penrhalt by a cutting 1,000 yards in length and 17 feet in mean depth; and curving, with a moderate radius, to cross under the turnpike road and join the Menai Bridge.

Mr. Giles, on proceeding from Penrhyn Park, recommends a more direct course than that of Mr. Stephenson, so as to bring his line nearly opposite to the end of the Menai Bridge; but in adopting this plan, he would have to encounter very formidable difficulties, in the construction of two viaducts and two tunnels, one of the latter being one mile and a quarter, and the other three quarters of a mile in length.

Passage of the Menai Bridge.

The passage of the Menai Bridge is the next point of importance. It has been supposed that this would have presented an insuperable obstacle to the lines of Messrs. Stephenson and Giles, but neither of these gentlemen proposes to cross the bridge with locomotive engines; the former suggesting that the railway carriages may be drawn over by horses, and the latter by a stationary engine.

There seems to be no objection to either of these plans, and the loss of time consequent upon them would probably not exceed one quarter of an hour.

The following observations will show the sufficiency of the Menai Bridge to sustain the weight of any number of railway carriages that may be required to pass over it.

In the first place, as far as regards the mode of passage, no important difficulty can be foreseen; the only question therefore, is one of strength.

The weight of a railway passenger-carriage, with its load, is commonly estimated at about five tons, and the length occupied by each carriage, from one connecting pin to another, may be taken at 22 feet, when several carriages are in connexion. This would give a pressure of only ·23 of a ton per lineal foot on the length of the bridge, supposing the platform to be wholly filled with such carriages.

Let us now see what weight the bridge is capable of sustaining.

It appears from the statement of Mr. Provis,* who was the resident engineer during the erection of this splendid structure, that the suspended part between the piers consists

Of

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* *See* Mr. Provis's valuable work on the Construction of the Menai Bridge.

	Tons.	cwt.
Of 16 main chains, including connecting plates, screws, bolts, &c. - - - - - - weighing	394	5
Of transverse ties - - - - - - —	3	16½
And of suspended rods, platforms, &c. - —	245	13½
The total weight being - -	643	15

The distance between the points of suspension is 579 feet 10½ inches, and the deflection 43 feet. With these data, the tension in terms of the weight may be readily computed, from the properties of the catenary curve; but it will, perhaps, be more satisfactory to derive it from the actual experiments of Mr. Rhodes, who superintended the erection of the chains, and who found, practically, the tension to amount to 1·7 times the weight. This makes the tension on the supporting chains from the weight of the structure alone to amount to 1,094 tons.

Now to sustain this tension, we have a sectional area in the 16 chains of 260 square inches, which, according to Mr. Barlow's experiments, made on the chain-cable testing machine at Woolwich, are capable of sustaining 2,600 tons, without injury to the elastic force of the iron, namely, 10 tons per square inch, the ultimate strength being 25 tons per square inch*.

	Tons.
If, then, from the absolute strength of the chains - -	2,600
We deduct the strain due to the weight of the bridge -	1,094
There remains a surplus strength of - -	1,506 tons.

which is competent, therefore, to sustain a uniform load (allowing the tension to be 1·7 times the weight) of $\frac{1506}{1 \cdot 7}$ or 886 tons. Now if the bridge were covered with loaded railway carriages on both sides, it would only be equivalent to 265 tons, leaving still a surplus strength of 621 tons. The objections, therefore, that have been raised respecting the capability of the bridge to bear the weight of the railway carriages which it might be required to support must be considered as utterly groundless.

Mr. Stephenson proposes to establish a station at each end of the bridge, where the locomotive engines would be kept in readiness to be attached to the trains.

No further difficulty occurs, in either of the lines, till they reach Maldraeth Marsh, where each would require an embankment. That of Mr. Stephenson would be of the mean height of 38 feet, and about two miles and a quarter in length, with a cutting of one mile and three quarters on one side, 20 feet in mean depth, and on the other of one mile in length and 27 feet in mean depth.

We find that the practicability of forming such an embankment has been doubted, in consequence of the nature of the soil; but it is to be remarked that the whole of this part of the island of Anglesea is of the coal formation, and as several coal pits have been sunk in this marsh, the buildings appertaining to which appear to have been supported without any extraordinary precaution, we do not apprehend any great difficulty will be found in the formation of the proposed embankment.

From Maldraeth Marsh to Holyhead the work is tolerably easy on both lines, with the exception of a tunnel of 1,605 yards in length, that Mr. Giles proposes to cut near Trefdraeth, by which means his embankment across the marsh would be less than that of Mr. Stephenson.

Opinion in favour of Mr. G. Stephenson's line to Holyhead.

Having thus followed the course of the lines of Messrs. Stephenson & Giles to their western terminus, it is proper that we should here observe, that after a careful consideration of all the properties of both, we feel bound to give the preference to the line proposed by Mr. Stephenson, on account of the greater facility and economy of construction that it admits of.

This line has, in an extent of 85 miles, only 1,504 yards of tunnel, whereas that of Mr. Giles has 8,538 yards, in the same distance. The gradients of both lines are favourable; but after what has been stated, it will only be necessary to detail those of Mr. Stephenson, viz.:

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* Mr. Barlow's Report to the Directors of the London and Birmingham Railway.

	Miles.	Chains.
Level - - - - - -	41	8
5 feet per mile and under - -	8	0
Above 5 feet and up to 10 feet -	7	20
Above 10 feet and up to 15 feet -	20	64
16 feet per mile - - - -	7	0
19 feet per mile - - - -	0	68
	85	0

With respect to Mr. Jenkins's line, it has been already stated that from the Upper Ferry, near Chester, to the point where this line turns off to Orme's Head, it is nearly identical with those of Messrs. Stephenson and Giles. From the point of divergence to its western terminus, at the Great Orme's Head, there is no heavy work excepting a tunnel of 660 yards in length, in clay slate rock.

Mr. Jenkins is, however, aware that this difficulty might be obviated, and the railway carried over a more favourable line by a small increase of its length.

Examination of the Lines to Portdynllaen.

On the termination of the inspection of the competing lines to Holyhead, on the 3d of January last, it was our intention, in pursuance of the instructions of the Lords of the Treasury, to examine the line which is proposed to connect Portdynllaen with that of the North Coast, at some point near Bangor, and afterwards to inspect the one projected from Portdynllaen by Barmouth, Dolgelly, Bala, and Shrewsbury; but on our arrival at Caernarvon we found it expedient to defer the former part of the proposed investigation.

At that place Mr. Henry Archer delivered to us a letter dated the 3d of January, in which he stated that he was then unable to lay before us the necessary documents for our examination of the line advocated by him, and that their preparation would require a month from that time. Under these circumstances, we felt that a satisfactory inquiry into the merits of this project could not then be entered upon, and we therefore forwarded Mr. Archer's letter for their Lordships' consideration, and confined ourselves to a general inspection of that part of the country through which we understood that the line in question would have to pass.

So far as the nature of the documents in our possession admitted of it, we subsequently examined the line projected by Mr. Vignoles for a railway communication from Portdynllaen towards Shrewsbury, the principal features of which we shall now describe.

An inclined plane would be necessary at Portdynllaen, to be worked by a stationary engine. From hence the first three miles rise at a gentle inclination; then two formidable cuttings will be required of 105 and of 96 feet in depth, in dense rock, and of about one mile in total length.

In the sections, both of Mr. Vignoles and Mr. Stephenson, an embankment is shown of nearly 27 feet in mean height, commencing about two and a half miles from Pwllbeli, and extending about an equal distance beyond that place, the harbour of which will have to be crossed. No further difficulty occurs until arriving at Criccaeth, a distance of about 18 miles from Portdynllaen; here the sections show very heavy work, both in cuttings and embankments, the latter, in crossing two lakes, being of considerable height and of one mile and a quarter in length, and the former being in very hard materials.

The next work of importance is the crossing, by embankments, the sands of Traeth Mawr and Traeth Bach. From hence, passing under Harlech Castle, the line would be formed on favourable ground; and we may here state, that the inclinations from Portdynllaen to this point are moderate, 16 out of the first 32 miles being nearly horizontal.

At Llanddwywe, 32½ miles from Portdynllaen, a plane commences, 14 miles in length, rising at the rate of one in 462.

In this distance the following difficulties have to be encountered: At Barmouth a tunnel of half a mile in length, in rock of the clay-slate formation, with deep cuttings of 80 feet at one end, and 70 at the other; and at Dolgelly a viaduct of not less than 170 feet in height, and about three quarters of a mile in length, over the valley of the Mawr.

From Dolgelly an inclined plane commences, which, rising for $10\frac{1}{6}$ miles at the rate of 1 in 150, brings the line to the summit, at about one mile beyond Drews-y-nant.

Here, on Mr. Vignoles' section, a tunnel is marked of two miles in length, with a cutting at the west end of 90 feet in extreme and of 45 feet in mean height, and two and a half miles long, and another cutting at the east end of 120 feet in extreme and of 60 feet in mean height, and one mile and a quarter long.

Mr. Stephenson states, that this tunnel would require to be three miles in length.

It would be impossible for us to give a decided opinion on this point without having the ground surveyed under our own direction, and we do not think that in the present stage of the inquiry it is necessary to take this course.

The summit of the pass, according to Mr. Vignoles' showing, is 710 feet above the level of the sea at low water. From hence the line descends at the rate of 1 in 640 to Bala, where his section terminates.

The table of gradients is as follows:

STATIONS.	Distances.				Gradients.		Difference of Level.	Rise or Fall.	Height above the Sea at Low Water.
	From Portdynllaen.		Intermediate Distances.		Feet per Mile.	Ratio of Perpendicular to Base.			
	Miles.	*ch.*	*Miles*	*ch.*			*Feet.*		*Feet.*
Portdynllaen - -	-	-	-	-	- -	- - -	- -	- -	70
Near W. end of tunnel	3	00	3	00	$7\frac{1}{3}$	1 in 720	22	R.	92
Pwllheli - -	8	00	5	00	$14\frac{5}{12}$	1 in 367	72	F.	20
Clan y-llan - -	14	00	6	00	- -	Horizontal	- -	- -	20
Near Morfa - -	19	12	5	12	$5\frac{1}{12}$	1 in 1,043	26	R.	46
Tremadoc embankment	22	12	3	00	$6\frac{1}{12}$	1 in 804	23	F.	23
Llanfihangel - -	24	00	1	68	$1\frac{2}{3}$	1 in 3,161	3	F.	20
Llanddwyre - -	32	40	8	40	- -	Horizontal	-	- -	20
Llanelltid - -	46	40	14	00	$11\frac{5}{12}$	1 in 462	160	R.	180
Near Drews-y-nant, at S. W. end of the summit tunnel	56	54	10	14	$35\frac{1}{3}$	1 in 150	360	R.	540
At N. E. end of the summit tunnel	58	54	2	00	25	1 in 211	50	R.	590
Beyond Bala - -	64	00	5	26	$8\frac{1}{4}$	1 in 640	44	F.	546

Mr. Stephenson's section is extended to Chirk, to show the probable inclinations of the proposed railway between that place and Bala.

From Bala to Corwen the gradients would be favourable, and the formation of the railway would present no extraordinary difficulty; but from the latter place to Llangollen Mr. Stephenson is of opinion that the earth-work would be severe, requiring at least three tunnels, through material of a very hard nature. We are inclined to coincide with this opinion, as we conceive it would be preferable to incur the expense which these tunnels would entail, than to work trains with a locomotive engine on curves of the short radius that would otherwise seem to be requisite.

The next 30 miles, namely, from Chirk to Shrewsbury, have not been surveyed with a view to the formation of the railway now under consideration, and therefore we can offer no opinion as to the line that might be selected in this part of the country; but a survey, on which Mr. Locke has reported, has been made from Wolverhampton to Shrewsbury.

This report, which will be found in the Appendix, and a section of the line, as prepared for Parliament, were laid before us, but we do not think it necessary to give a detailed description, or an opinion on this project, as it has not the sanction of Mr. Locke's recommendation. We will therefore only observe, that from an examination of the country between Wolverhampton and Shrewsbury, it does not

See Appx. (F.)

not appear that any great engineering difficulty would have to be encountered; and as it is a line that, in our judgment, could not fail to be very beneficial to the district through which it would pass, we consider it probable that it will eventually be executed.

We have to remark, that in our examination of the north coast lines, as well as of the line by the Bala Pass, we had the advantage of the co-operation of Colonel Cunningham, who concurred in the opinion which we have now expressed; but the state of that officer's health has unfortunately precluded him from taking part in our subsequent investigations, and his name is consequently not attached to this Report.

Your letter of the 14th January $\left.\frac{1074}{1075}\right\}$ 13/1, conveyed to us the consent of the Lords of the Treasury to Mr. Archer's request, for the postponement of our inspection of the line advocated by him, and your letter of the 14th February (3254) $\frac{11}{2}$, instructed us to examine and report upon a line to Portdynllaen, *viâ* Worcester and Newtown, pursuant to the Address of The House of Commons of the 4th July 1840.

It was subsequently intimated to us that an extension of time had been granted to the parties interested in the lines for the Dublin communication till the 12th March.

On that day plans and sections of the Worcester and Portdynllaen line, and a section of the Bangor, Caernarvon, and Portdynllaen line were delivered to us, but as those documents were deficient in the necessary details, they were returned to the parties concerned, for the purpose of being rendered complete.

Examination of the line from Bangor *viâ* Caernarvon to Portdynllaen.

On the 25th March we were informed that the necessary additions had been made, and on that day the examination of Mr. Archer's line was entered upon, in conjunction with that gentleman and Mr. Wellington Purdon, by whom it had been surveyed, under the direction of Mr. Vignoles.

This line commences at the Bangor turnpike road, near the corner of Penrhyn Park; passes to the southward along the valley which lies behind the town of Bangor; runs within a mile and a quarter of Caernarvon; crosses the Bedgellert and Caernarvon road, close to Penrose toll-bar, and proceeds nearly in a straight line by the Chapel of Tynybout, and across the eastern side of Lord Newborough's park. From thence it takes a direct course to Clynog, and crosses the Llanlofty and Tyne streams.

From Clynog it runs parallel to the high road to Eternion, at which place the road turns off towards Pwllbeli.

The line of the proposed railway then proceeds in the direction of the north-western or seaward peak of the Rivel chain, which must be passed by means of a tunnel 630 yards long; crosses Vortigern's Valley, and after passing over a narrow gulley reaches the cliff at Pestill, in which a tunnel of 1,144 yards in length will be necessary, opening out on the southern side of the hill into deep cutting.

The line generally from hence keeps parallel to the sea-coast to Nevin, where it curves round to the western promontory of Portdynllaen Harbour.

The foregoing being the general direction of the route, we shall now proceed to describe its details.

In the first 5 ¾ miles, which are horizontal, the following work will be necessary.

A cutting of about three-fifths of a mile in length, and of the average depth of 36 feet; then a bridge of one arch of 58 feet in height over the Ogwin; afterwards a cutting, 45 chains in length, of the extreme depth of 70 feet, and the average depth of 55 feet, through the ridge south of Bangor, and, lastly, two cuttings of about 10 chains each, and of 50 and 40 feet deep.

For the next two miles the work will be very slight; then a viaduct of 10 chains in length, and of the extreme height of 100 feet, will be required over the valley through which Mr. T. Ashton Smith's railway passes to his slate quarries.

On either side of this viaduct there will be about three quarters of a mile of cutting, of the average depth of 18 feet.

The next gradient rises 1 in 981 for a length of 6 ½ miles to the summit of the line. The work in this length is shown on the section as being extremely easy, with the exception of a viaduct of five chains over the river Sciont, (the maximum height being 50 feet,) and a bridge over the river Gwrfai, of one arch 50 feet high, with embanked approaches, made up from the adjacent cuttings, of a mile and a half in total length, and of the extreme depth of 24 feet.

From hence the line falls 6 ¾ miles, at 1 in 398.

For the first five miles the rails will be nearly on the surface.

In this distance, the river Tyne will be crossed on a bridge, of one arch, 80 feet in height, connected with embankments on both sides.

Then the river Llanllyfni will be passed on a bridge, of one arch, 75 feet in height, followed by some low embankments, of 1⅝ mile in length.

The following 3⅜ miles have a gradient of 1 in 1,017. The work required consists of two pieces of cutting, amounting to 1⅜ of a mile in length, and of an average depth of 17 feet. There will be an embankment (filled up from the last-named cutting) of about seven-eighths of a mile, and of about 14 feet in height, with a bridge of one arch over a small river. The next eight miles fall at the rate of 1 in 1,408, carrying the line to Portdynllaen, at about 90 feet above high water. There will be in this distance a piece of cutting about 27 chains long, and averaging 28 feet in depth.

Two small gullies will have to be passed on embankments; one of 36 and the other of 38 feet in height, which will connect the line with the shorter tunnel.

This tunnel, as has been already stated, will be 630 yards long, and will pass through the base of the north-western promontory of the Rivel mountains, in a rock which is represented in Mr. Greenough's recently published Geological Map, as being of the clay-slate formation.

The next mile will require alternate slight cuttings and embankments, followed by a filling of 110 feet in height, and 16 chains in length, composed of materials from the tunnels. The tunnel through the Pestin Cliff will be 1,144 yards long, entering from the upright face of the cliff, and issuing in a cutting of 42 chains in length, of the extreme depth of 80 feet, and of an average depth of 50 feet.

Between this point and Portdynllaen there is no work requiring particular notice, excepting a cutting of a quarter of a mile in length, and of the extreme depth of 65 feet. The terminus would be about 90 feet above low water-mark.

Having described this line in sufficient detail, it is proper to state, that it appears to have been selected with much judgment.

It is now necessary to consider how it could be made a portion of the great chain of communication between London and Dublin.

We have expressed our opinion, that the best line from Chester to Bangor is the one proposed by Mr. Stephenson, and therefore it is with this line that the Caernarvon line (as we shall designate that advocated by Mr. Archer) would have to form a junction, if Portdynllaen should be selected as the station for the Dublin packets.

It has been already stated, that the Caernarvon line commences at the Bangor road, near the corner of Penrhyn Park; but it unfortunately happens that at this point it is 80 feet above the level of Mr. Stephenson's line.

No plan has been laid before us by which we could determine the best mode of connecting the two lines; but there is no doubt that the junction might be effected by using an inclined plane, or by bringing Mr. Stephenson's line by steeper gradients than those proposed by him up to the level of the terminus of the Caernarvon line. In both cases, however, this difference of level operates as a defect in the project now under consideration, which is not attributable to any mismanagement on the part of the engineer, but to the nature of the country.

It remains for us to describe the line by Dolgelly, Carno, Newtown, Worcester, and Oxford, to the intended junction with the Great Western Railway.

Examination of the Line to Portdynllaen by Oxford, Worcester, Newtown, and Dolgelly.

It is proposed that this line should be connected with the Great Western Railway at a place called Dudcot, about 52½ miles from London, and with the line projected by Mr. Vignoles at a few miles to the westward of Dolgelly.

We have already given a description of that part of Mr. Vignoles' line which intervenes between Dolgelly and Portdynllaen, and as respects the Great Western line, from London to Dudcot, it is only necessary that we should insert, in a subsequent part of this Report, a statement of its gradients. We shall, therefore, now confine ourselves to a detail of the proposed line from the neighbourhood of Dolgelly to Dudcot, which may be divided into four portions.

1. From Portdynllaen to Dolgelly, being the part surveyed under the direction of Mr. Vignoles.

2. From Dolgelly to Newtown, surveyed by Mr. Newnham.

3. From Newtown to Worcester, surveyed by Messrs. Varden ; and

4. From Worcester to Dudcot, surveyed by Mr. Hennet, under the direction of Mr. Brunel.

Description of the Line from Dolgelly to Newtown.

Mr. Newnham has selected the line of the Carno Pass. Joining Mr. Vignoles' section at 40 ½ miles from Portdynllaen, he crosses the valley of the Mowddach, and after intersecting the road from Capel Arthog to Dolgelly, and keeping parallel to it for about four miles, he takes a course to the southward of the town, and skirting the base of Cader Idris, leaves the valley of the Mowddacb by a tunnel, of about three miles and a half in length, which takes the line into the valley of the Afon Geryst; from hence, after crossing the Dovey, the line passes by a tunnel of half a mile through the hill of Cefn-cock, and leaving Mallwyd about a mile to the southward, crosses the road between Welch Poole and Mallwyd. Near Blaen Tafolog another tunnel will be necessary of two miles in length. Issuing near Dolfawr, the line keeps in the course of the valley, and after passing through a tunnel of 1,570 yards in length, reaches the summit at Carno. From hence it proceeds along the vale of the Afon Gorna to Llanwnog, where it skirts the high ground, keeping a course parallel to the turnpike road; and after passing Aberhavesp, it crosses the river Severn, and passes on to the Newtown station.

The following Table shows in detail the probable extent of earth work that would be required, and the gradients from the junction with Mr. Vignoles' line to Newtown.

The cuttings will chiefly be in rock of the clay-slate formation, and the line passes through a district which abounds in quarries of excellent slates.

GRADIENTS.		EARTH WORK.				REMARKS.
Length.	Inclination.	Length.		Height or Depth.		
				Extreme.	Mean	
			Yards.	Feet.	Feet.	
550 yards - -	level - -	cutting - -	350	50	30	
		filling - -	180	50	20	
1 mile 670 yards -	1 in 211 -	filling - -	300	83	70	
		filling - -	{500 373}	112	- -	- - Viaduct over Mowddach.
		tunnel - -	220			
		filling - -	370	45	35	
1 mile 660 yards -	1 in 251 -	cutting - -	1,000	33	18	
		filling - -	200	80		
		cutting - -	1,250	30	20	
		filling - -	230	20	15	
		tunnel - -	200			
		filling - -	220	40	30	
		tunnel - -	220			
2 miles - - -	1 in 211 -	cutting - -	300	40	26	
		filling - -	60	46		
		cutting - -	330	32	20	
		filling - -	540	55	40	
		cutting - -	180	27		
		cutting - -	530	28		
		filling - -	180	60	33	
		cutting - -	640	30	20	
		filling - -	390	135	75	- - Viaduct at Dolgelly, over Arran Afon.
3 miles 880 yards -	1 in 251 -	cutting - -	500	28	20	
		cutting - -	270	30		
		cutting - -	160	50	30	
		filling - -	380	58	37	
		cutting - -	300	23		
		filling - -	400	122	63	Brook near Caerwnych.
		filling - -	1,130	33	23	
		cutting - -	660	20	10	
		filling - -	600	75	20	

GRADIENTS.		EARTH WORK.				REMARKS.
Length.	Inclination.	Length.		Height or Depth.		
				Extreme	Mean.	
			Yards.	Feet.	Feet.	
5 miles 350 yards	1 in 294	cutting	1,100	20		
		tunnel	190			
		tunnel	3 miles 920	- -	- -	- - Mowddwy tunnel, in which the length of the five proposed shafts are, 1st. 440 feet. 2d. 840 – 3d. 965 – 4th. 540 – 5th. 150 –
		cutting	650	85	50	
		cutting	970	50	28	
		filling	200	40	22	
1 mile 250 yards	1 in 406	cutting	920	62	40	
		tunnel	450			
		cutting	230	60	38	
		filling	595 310	160	150	- - Viaduct at Dinas Mowddwy.
3 miles 450 yards	1 in 211	continuation of filling	180	70	40	
		cutting	70	60	30	
		tunnel	1,040	- -	- -	Cefn Cock.
		cutting	57	60	30	
		filling	320	50	26	
		cutting	1,700	38	26	
		filling	250	95	50	- - Viaduct near Pont-ar-Bwlfa.
		cutting	2,020	70	34	
8 miles 1,150 yards	1 in 264	tunnel	2 miles 530	- -	- -	Tafolog.
		cutting	600	57	32	
		cutting	620	40	20	
		filling	260	40	20	
		cutting	3,300	30	16	
		filling	1,250	40	20	
		filling	500	70	25	- - Viaduct over Afon Yal.
		tunnel	250			
		filling	70	30		
		cutting	160	60		
		tunnel	1,570			
		cutting	1,220	60	25	
4,290 yards	Summit level	cutting	1,290	20	15	
9 miles 1,320 yards	1 in 264	cutting	2,700	15	7	
		filling	450	22	12	
		cutting	600	18	10	
		cutting	500	10	5	
		cutting	1,300	23	10	
		cutting	940	35	20	
		filling	240	72	50	- - Viaduct over Afon Garno.
		cutting	780	53	40	
		filling	560	40	20	
		cutting	3,300	85	52	
		cutting	700	30	20	
		filling	470	60	30	
		cutting	1,070	55	20	
		filling	430	50	20	
		cutting	240	30	17	
		filling	520	32	15	
		cutting	1,350	75	35	
		filling	480	62	25	
2 miles 330 yards	1 in 347	filling	1,400	50	40	River Severn.
		cutting	400	40	20	
		cutting	220	60	30	
		tunnel	320			
		cutting	460	70	40	
		cutting	770	40	20	

It will be perceived that there are in this line very heavy and expensive works.

The total length of the proposed tunnels in this distance of 40 ½ miles is no less than 8 miles and 630 yards, and as the principal tunnel is 3 miles and 920 yards in length, through a hill of considerable altitude, composed of rock of the clay-slate formation, with some portion of porphyry, there is no doubt that the completion of this line would occupy several years.

Description of the line from Newtown to Worcester.

The line of Messrs. Varden commences at the Newtown station. It intersects the turnpike road leading to Kerry, and runs nearly parallel to the course of the Severn for about three miles, when it turns off to the eastward, passes over the turnpike road from Kerry to Montgomery, and after going through Sarn, crosses under the turnpike road to Churchstoke. It then takes a direction towards Lydham, crossing, at Aston Hall, the turnpike road between Bishop's Castle and Montgomery; thence it proceeds till it reaches the vale of the Onny River, which it crosses several times. At Streatford Bridge it is carried under the Church Stretton turnpike road, and sweeping round the foot of Norton Hill, on which are the remains of a celebrated Roman encampment, it runs parallel to the Onnybury road to Ludlow, where it passes the Corne River on a bridge.

From Ludlow the line follows the course of the Teme for several miles, taking a direction, between Ashford church and the village, to the vicinity of Little Hereford, where it runs parallel both to the Leominster canal and to the turnpike road to Tenbury. From hence it keeps the vale of the Teme, occasionally being carried over the river, and finally reaches the Worcester terminus to the southward of the town, after crossing the River Severn by a bridge of three arches, two being of 60, and one of 80 feet span, and of 35 feet in height.

Messrs. Varden have given in drawings of their line, on which are marked not only the actual section levelled by them, but also another section, which, though not levelled, they assert could be obtained on a fresh survey of the country.

The following Table of gradients and cuttings shows the probable extent of the earth-work according to both sections, for although we cannot vouch for the accuracy of the section which has not been positively levelled, and should feel bound, if a close comparison were necessary with any other line, to regard the levelled section only as the one on which we ought to decide, we yet consider ourselves warranted in saying, from a close inspection of the country, that if time had been allowed to Messrs. Varden, they would, in all probability, have obtained as good a line as that which they have assumed.

The distance between the Newtown and the Worcester stations is about 61 ½ miles. The cuttings for the first 30 miles are in limestone, and the remainder in freestone, gravel, and alluvial soil.

ACCORDING TO THE ORIGINAL SECTION.							According to a Section which, on a fresh Survey, it is believed may be obtained.			
GRADIENTS.			EARTH WORK.				EARTH WORK.			
Length.		Inclination	Length.		Height or Depth.		Length.		Height or Depth.	
					Extreme.	Mean.			Extreme.	Mean.
Miles.	*Chains.*			*Yards.*	*Feet.*	*Feet.*		*Yards.*	*Feet.*	*Feet.*
1	40	1 in 282	filling -	1,020	93	40	cutting -	600	26	18
			cutting -	330	30	20	filling -	430	20	16
			filling -	1,170	100	60	cutting -	650	48	30
							filling -	940	60	35
4	0	1 in 302	filling -	320	66	36	filling -	130	60	30
			cutting -	350	18	10	cutting -	540	30	15
			filling -	170	30	15	filling -	170	30	15
			cutting -	1,300	46	22	cutting -	1,320	46	22
			filling -	3,900	78	35	filling -	950	46	20
5	40									

ACCORDING TO THE ORIGINAL SECTION.							According to a Section which, on a fresh Survey, it is believed may be obtained.			
GRADIENTS.			EARTH WORK.				EARTH WORK.			
Length.		Inclination.	Length.		Height or Depth.		Length.		Height or Depth.	
					Extreme.	Mean.			Extreme.	Mean.
Miles.	*Chains.*			*Yards.*	*Feet.*	*Feet.*		*Yards.*	*Feet.*	*Feet.*
5	40		cutting	960	40	20	cutting	180	4	2
							filling	460	30	10
							cutting	600	30	15
							filling	420	16	8
							cutting	400	15	8
							filling	390	40	20
							cutting	310	10	8
							filling	120	9	4
							cutting	960	40	20
5	0	1 in 1,320	cutting	1,660	56	38	cutting	1,660	56	38
			filling	1,600	28	14	filling	1,600	28	14
			cutting	300	14	8	cutting	300	14	8
			filling	100	3	1	filling	100	3	1
			cutting	200	5	2	cutting	200	5	2
			filling	850	22	14	filling	850	22	14
			cutting	1,450	48	26	cutting	770	20	11
			filling	20	10	5	filling	60	10	5
			cutting	1,850	48	20	cutting	570	27	14
			filling	620	30	17	filling	960	20	14
							cutting	860	18	14
							filling	680	32	17
4	40	1 in 848	filling	150	13	6	filling	260	14	7
			cutting	1,400	26	13	filling	1,470	52	14
			filling	630	52	20	cutting	360	12	6
			cutting	440	30	16	filling	50	20	10
			cutting	1,570	54	40	cutting	840	16	12
			filling	20	10	5	filling	20	20	10
			cutting	400	8	4	cutting	200	8	4
			filling	1,700	30	11	filling	300	6	3
			cutting	1,400	46	26	cutting	400	8	4
							filling	1,700	30	11
							cutting	1,400	46	26
6	40	1 in 291	cutting	3,000	24	18	cutting	3,000	24	18
			cutting	1,000	32	20	cutting	1,000	32	20
			cutting	1,550	15	9	cutting	1,550	15	9
							cutting	1,400	20	16
							filling	120	15	10
			cutting	2,400	70	30	cutting	600	8	4
			filling	20	15	10	filling	600	22	8
			cutting	24	6	3				
			filling	1,150	14	8	filling	1,150	14	8
			cutting	1,050	37	20	cutting	1,050	37	20
			filling	230	7	3	filling	230	7	3
			cutting	420	14	7	cutting	420	14	7
3	0	1 in 317	filling	2,750	34	20	filling	2,800	34	20
			cutting	1,300	45	35	cutting	1,250	16	12
			filling	1,230	27	17	filling	650	5	2
							cutting	570	12	8
4	0	1 in 264	filling	3,350	35	20	filling	1,050	14	9
			cutting	300	15	8	cutting	400	27	17
			filling	1,400	30	20	filling	700	15	8
			filling	1,800	8	3	filling	750	10	7
							cutting	500	17	8
							filling	1,250	23	13
							cutting	1,230	12	7
							filling	500	9	4
2	0	1 in 621	filling	2,460	35	10	filling	2,460	35	10
			cutting	1,050	64	29	cutting	1,050	64	29
6	0	1 in 674	filling	1,030	46	24	filling	950	20	10
			cutting	170	14	10	cutting	450	35	18
			filling	750	16	8	cutting	430	17	10
			cutting	270	8	6	filling	170	26	16
			filling	200	26	20	cutting	320	10	5
			filling	1,700	30	20	filling	450	6	3
			filling	1,800	40	17	cutting	550	12	7
			cutting	1,320	29	18	filling	360	20	9
			filling	1,100	27	10	cutting	400	9	4
36	40		filling	800	20	20	filling	1,300	35	8

(*continued*)

ACCORDING TO THE ORIGINAL SECTION.							According to a Section which, on a fresh Survey, it is believed may be obtained.			
GRADIENTS.			EARTH WORK.				EARTH WORK.			
Length.		Inclination.	Length.		Height or Depth.		Length.		Height or Depth.	
					Extreme.	Mean.			Extreme	Mean.
Miles.	Chains.			Yards.	Feet.	Feet.		Yards.	Feet.	Feet.
36	40		filling -	1,150	45	40	cutting -	1,320	29	18
							filling -	400	27	10
							cutting -	400	8	3
							filling -	500	20	7
							cutting -	1,430	23	14
4	50	1 in 332	filling -	7,300	33	20	cutting -	1,260	33	18
			cutting -	150	10	5	filling -	530	37	20
			filling -	460	10	5	cutting -	200	9	4
			cutting -	120	12	6	filling -	2,700	30	18
							filling -	1,060	22	15
							cutting -	370	54	25
							filling -	460	10	7
7	70	1 in 1,218	cutting -	600	16	10	cutting -	1,450	50	20
			filling -	40	18	10	cutting -	700	36	17
			cutting -	750	35	20	filling -	2,500	18	7
			filling -	2,300	16	10	cutting -	1,600	15	7
			cutting -	600	38	15	filling -	900	12	6
			filling -	850	18	9	cutting -	1,500	19	13
			cutting -	1,650	46	20	filling -	1.450	14	10
			filling -	420	6	3				
			cutting -	1,600	15	8				
			filling -	900	12	8				
			cutting -	200	10	7				
			cutting -	120	60	30				
			tunnelling	1,450						
			cutting -	200	60	30				
			filling -	1,300	14	8				
			cutting -	130	30	15				
10	0	1 in 1,650	cutting -	750	30	20	cutting -	750	16	7
			filling -	900	17	14	filling -	900	17	8
			cutting -	300	11	5	cutting -	300	11	6
			filling -	250	7	4				
			cutting -	2,550	90	35	cutting -	2,700	19	15
			filling -	1,800	14	9	filling -	1,800	14	9
			cutting -	2,300	54	40	cutting -	2,300	14	9
			filling -	75	11	8	filling -	400	9	4
			filling -	500	25	15	cutting -	400	23	10
			cutting -	750	42	35	filling -	320	30	16
			filling -	900	30	17	cutting -	700	28	20
			cutting -	1,400	46	23	filling -	800	40	14
			filling -	400	17	8	cutting -	400	20	14
			cutting -	1,550	20	11	cutting -	1,150	17	5
			filling -	1,550	33	9	filling -	400	17	8
			cutting -	550	12	9	cutting -	1,550	20	11
							filling -	1,550	33	9
							cutting -	550	12	9
2	40	1 in 367	cutting -	700	14	9	cutting -	700	14	9
			cutting -	1,250	10	8	cutting -	1,250	10	8
			filling -	230	40	20	filling -	230	40	20
			cutting -	950	12	9	cutting -	950	12	9
61	40	Total.	filling -	650	28	20	filling -	650	28	20

It is understood that within about five miles of Messrs. Varden's line, and about 15 miles from Newtown, several copper and lead mines have been recently discovered, of which some have been worked.

At about 37 miles from Newtown, and within four miles of the line, there are coal fields and ironstone, which latter is said to be of a very valuable description. There are also extensive coal fields at Pensax, near the line, and about 48 miles from Newtown.

Description of the Line from Worcester to Dudcot.

The line surveyed by Mr. Hennet, under Mr. Brunel's direction, commences at the Worcester station, and after crossing the Birmingham canal and the Birmingham and Gloucester railway, passes to the north of the town of Pershore.

From hence it takes the direction of Evesham, crossing the River Avon at Fladbury, and afterwards twice, near Evesham. It then runs nearly parallel to the turnpike road as far as Bretforton, where it sweeps round Church Honeybourne at the foot of Bayly's Hill, and crosses the turnpike road about midway between the town of Chipping Campden and the village of Ebrington.

It proceeds from hence towards Moreton-in-the-Marsh, where there will be a short tunnel; and, entering the vale of the Evenlode, continues in very nearly a straight direction until it passes the Chipping Norton and Burford road, about half way between those places. It then curves round to the eastward, following nearly the course of the Evenlode, by the villages of Shorehampton and Charlbury, close to the north side of Cornbury Park, where it crosses the river. Between that point and Oxford the Evenlode is again crossed, at eight different places, and before reaching the Oxford station the Isis is also crossed; but the bridges for the passage of these rivers would not be works of much importance.

After passing the Oxford Canal and the turnpike road between Oxford and Abingdon the line proceeds, with easy work, to join the Great Western Railway at Dudcot.

The following Table shows the quantity of the earth-work on the line, from Worcester to Dudcot:

Length.		Description of Work.	Height or Depth.			Length.		Description of Work.	Height or Depth.		
			Extreme.	Mean.					Extreme.	Mean.	
Miles.	*Chains.*		*Feet.*	*Feet.*	*Inches.*	*Miles.*	*Chains*		*Feet.*	*Feet.*	*Inches.*
0	21	filling -	39	33	0	0	10	filling -	8	6	0
0	10	cutting -	21	13	0	0	23	cutting -	11	8	0
0	61	filling -	16	14	0	1	62	filling -	14	9	0
1	21	cutting -	30	17	6	1	42	cutting -	50	27	0
0	77	cutting -	45	26	0	0	44	filling -	14	9	0
0	50	cutting -	27	16	0	0	18	cutting -	9	5	0
1	9	filling -	23	12	0	0	17	filling -	17	10	0
0	14	cutting -	6	4	0	0	22	cutting -	13	10	0
0	21	filling -	6	3	6	2	75	filling -	18	15	0
0	41	cutting -	28	14	0	0	36	cutting -	5	3	0
1	6	filling -	26	16	6	0	65	filling -	21	17	0
1	15	cutting -	14	8	0	0	15	cutting -	10	7	0
0	40	filling -	30	13	0	0	20	filling -	16	10	0
0	52	filling -	14	4	0	2	56	cutting -	25	12	0
0	40	surface -	—	—		0	18	filling -	25	15	0
0	54	cutting -	13	7	0	1	11	cutting -	30	18	0
0	39	filling -	21	17	0	0	71	filling -	24	20	0
1	15	cutting -	28	12	0	0	18	cutting -	9	7	0
1	6	filling -	29	17	6	0	26	filling -	22	16	0
0	43	cutting -	31	18	0	0	26	cutting -	38	30	0
0	28	filling -	34	24	0	0	18	filling -	21	16	0
0	55	cutting -	39	24	0	0	13	cutting -	9	6	0
0	59	filling -	25	13	0	0	26	filling -	18	15	0
0	21	cutting -	7	4	0	0	14	cutting -	23	12	0
1	54	filling -	21	10	0	0	23	filling -	19	13	6
2	17	cutting -	15	6	6	0	6	cutting -	12	8	0
1	12	filling -	30	19	0	0	19	filling -	18	13	0
0	65	cutting -	60	15	0	0	3	cutting -	20	12	0
0	75	tunnel -	—	—		1	47	filling -	18	16	0
1	12	cutting -	60	17	0	0	21	cutting -	26	19	0
2	36	filling -	31	14	0	1	64	filling -	17	11	0
0	32	cutting -	22	10	0	0	69	cutting -	26	13	0
0	17	filling -	35	19	0	0	68	filling -	12	8	6
0	47	cutting -	53	24	0	0	60	cutting -	16	9	0
0	16	tunnel -	—			4	76	filling -	8	5	6
1	57	cutting -	50	20	0	2	58	cutting -	16	9	0
0	19	filling -	5	3	0	0	76	filling -	16	14	0
0	21	cutting -	6	5	0	1	10	cutting -	33	20	0
0	10	filling -	7	5	0	2	75	filling -	24	17	0
0	20	cutting -	6	4	0						

The following Table shows the gradients from Worcester to Dudcot:

Length of Plane.		Gradient.		Ratio.	Length of Plane.		Gradient.		Ratio.
Miles.	Chains.	Feet.	Inches.		Miles.	Chains.	Feet.	Inches.	
3	0	16	0	1 in 330	1	23	10	0	1 in 528
2	0	16	0	1 in 330	1	26	- level.		—
0	55	10	0	1 in 528	6	47	10	0	1 in 528
1	25	12	0	1 in 440	0	77	- level.		—
2	0	4	0	1 in 1,320	14	58	10	0	1 in 528
2	0	- level.		—	1	40	4	0	1 in 1,320
1	8	10	0	1 in 528	1	52	8	2	1 in 646
1	10	- level.		—	0	74	6	0	1 in 880
1	40	10	0	1 in 528	0	30	- level.		—
0	56	- level.		—	0	46	5	3	1 in 1,005
3	45	12	0	1 in 440	0	14	- level.		—
4	0	58	6	1 in 90	1	29	6	7	1 in 802
1	70	16	0	1 in 330	0	78	- level.		—
0	30	- level.		—	0	59	8	0	1 in 660
3	30	16	0	1 in 330	2	0	5	0	1 in 1,056
1	40	- level.		—	0	68	2	3	1 in 2,346

General Summary of the Gradients from London to Portdynllaen.

	Miles.	Chains.
Level, and up to 5 feet per mile - - - - -	111	12
Above 5 feet, and up to 10 feet per mile - - -	63	11
— 10 — — 16 — — - - -	25	46
— 16 — — 18 — — - - - -	26	16
20 and 21 feet per mile - - - - - -	23	22
25 feet per mile - - - - - - - -	6	50
Inclined plane, 58 feet 6 inches per mile - - - -	4	0
	259	77

The rate of travelling on the Great Western is too well known to render it necessary for us to make any observations upon it; and we have only to remark, that the nature of the country from Dudcot to Worcester is eminently calculated for a railway, and that the line has been judiciously chosen to admit of high velocities, there being only one plane of severe inclination. The gradients proposed between Newtown and Worcester are very favourable; and we may observe, that from Newtown to London, a distance of 180 miles, there would only be about 1¼ mile of tunnel.

From Newtown to the Carno summit nothing of a formidable character presents itself; and it is only from thence to the junction with Mr. Vignoles's line, beyond Dolgelly, that serious difficulties have to be encountered.

See Appx. (G.) In Mr. Brunel's report to us, which will be found in the Appendix, it is stated that circumstances have prevented this district being thoroughly explored by the surveyors, and that a better line than the one submitted would be found, on a careful and minute examination of the country. To what extent this may be the case it is not for us to pronounce; but although, from our own observation, we concur in Mr. Brunel's opinion, we feel justified in stating that, taking into consideration the very inadequate time allowed to Messrs. Varden and to Mr. Newnham to prepare their sections, and the very difficult nature of the country they had to examine, they appear to have evinced much ability in the selection of their lines.

In our examination of the line from Worcester to Dudcot we were accompanied by Mr. Brunel and his surveyor, Mr. Hennet. Mr. R. Varden and Mr. Newnham pointed out their respective lines between Dolgelly and Worcester.

Opinion upon the competing Lines to Portdynllaen.

Having described the principal features of the three competing lines from London to Portdynllaen, it will be obvious that as regards the extent of new railway to be formed, the facility and economy of construction, and the time to be employed in the work, the preference should be given to the route by Chester, Bangor, and Caernarvon; and it will be seen by the following Tables, that with the single exception of time to be expended in the journey, in which the advantage would be decidedly in favour of the Worcester line, all the tested properties are in favour of that by Chester, Bangor, and Caernarvon.

Table (A) shows the length of line already formed, the length of line in progress, the length remaining to be formed, and the total distance between London and Portdynllaen.

TABLE (A.)

Lines Formed, in Progress, or to be Formed.	NAMES OF THE LINES.		Length of Line Formed and in Progress.	Length of Line to be Formed.	Total Distance from London to the Port.
	London, Chester, and Portdynllaen:		*Miles. Ch.*	*Miles. Ch.*	*Miles. Ch.*
Formed - -	London to Crewe - - - -	165 49			
In progress -	Crewe to Chester - - - -	20 52	186 21		
To be formed -	Chester to Portdynllaen - -	88 55	- -	88 55	
	Total - - -		- -	- -	274 76
	London, Shrewsbury, and Portdynllaen:				
Formed - -	London to Wolverhampton - - -		126 0		
To be formed -	Wolverhampton to Shrewsbury -	31 40			
	Shrewsbury to Portdynllaen -	115 0	- -	146 40	
	Total - - -		- -	- -	272 40
	London, Oxford, Worcester, and Portdynllaen:				
Formed - -	London to Dudcote - -	52 30	52 30		
To be formed	Dudcote to Oxford - - -	9 20			
	Oxford to Worcester - -	56 70			
	Worcester to Newtown - -	61 40			
	Newtown to the junction with Mr. Vignoles's line, near Dolgelly - - - - - -	40 0			
	Mr. Vignoles's line, from the junction near Dolgelly to Portdynllaen - - - - -	40 40	- -	208 10	
	Total - - -		- -	- -	260 40

In computing the distance from London to Crewe to be 165 miles 49 chains, we base our calculation on the length of the present line to Birmingham, and thence by the Grand Junction to Crewe; but if a line should be executed from Rugby to Stafford, or from Rugby to Stone, the distance would be shortened by about eight miles.

The other distances in this Table are obtained as follows:—

That from Crewe to Chester is taken from Bradshaw's Tables.

That from Chester to Portdynllaen is taken from Mr. George Stephenson's section, as far as Penrhyn Park wall, confirmed by Mr. Giles's section, and partly also by that of Mr. Jenkins; and from Penrhyn Park wall to Portdynllaen the distance is taken from Mr. Purdon's section.

That from London to Wolverhampton is an admitted measured distance.

That from Wolverhampton to Shrewsbury is taken from a section deposited in the Private Bill Office, and the distance from Shrewsbury to Portdynllaen is ascertained in the undermentioned manner:—

Mr. Vignoles represents the distance from Portdynllaen to Llangollen as being 85 miles and 20 chains* by his proposed railway line, and the distance by the turnpike road between Llangollen and Shrewsbury is 30 miles and 40 chains, making a total of 115 miles 60 chains; we therefore feel justified in putting the whole distance as at least 115 miles for a railway.

The distance from London to Dudcot is taken from the section of the Great Western Railway.

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* *See* Mr. Vignoles's diagram section on his map of North Wales, published with the Report on Irish Railways.

That from Dudcot to Oxford from the section deposited in the Private Bill Office.

That from Oxford to Worcester from the section recommended by Mr. Brunel.

That from Worcester to Newtown from the section prepared by Messrs. Varden; that from Newtown to Dolgelly from the section prepared by Newnham; and that from Dolgelly to Portdynllaen from Mr. Vignoles's section.

The foregoing table shows that by adopting the line by Chester, Bangor, and Caernarvon to Portdynllaen, there would only be about 88 miles and 55 chains of new railway to form, whereas by the Shrewsbury and Bala line there would be 146½ miles, and by the Worcester line 208 miles.

The comparatively small amount of capital that would therefore be required for the Chester and Bangor route to Portdynllaen, is a strong argument in its favour; and it will be observed, by an examination of Tables (B) and (C), that there are other reasons which contribute to entitle that line to a preference.

Table (B) shows the relative amount of population of the country through which the projected lines of new railway would pass, and the average coach traffic.

TABLE (B.)

NAMES OF THE NEW LINES.	Miles to be Formed.	Population per Mile.	Average Coach Traffic, per Annum per Mile.
	Miles. Ch.		
Chester, Bangor, and Caernarvon to Portdynllaen -	88 55	4,836	18,723
Wolverhampton, Shrewsbury, and Portdynllaen -	146 40	3,252	4,438
Oxford, Worcester, and Portdynllaen - - -	208 10	3,936	7,819

In the route from Chester to Portdynllaen we have taken the population of Anglesea, Caernarvonshire, Denhigbshire, Flintshire, and part of Cheshire.

In the route through Shrewsbury we have included the population of the counties of Salop, Montgomery, Merioneth, Denbigh, and Caernarvon.

In the line from Dudcot to Portdynllaen we have allowed for the population of part of Oxfordshire, Worcestershire, Berkshire, Buckinghamshire, Warwickshire, Gloucestershire, Shropshire, Cardiganshire, and the whole of Herefordshire, Montgomerysbire, Merionethsbire, Caernarvonshire, and Radnorshire.

In each case the population is taken from the Census of 1831, and the amount being divided by the number of miles in length of the proposed new line gives the result specified in the preceding table, from which it will be seen that the population to be accommodated is greater by the Chester than by either of the other lines.

We have hitherto only regarded the competing lines with reference to London and Dublin, and the intermediate districts, but it is also necessary to see how the case stands with respect to the manufacturing districts of the North of England.

Having taken London as the point of departure of the southern counties, we propose to take Manchester for the northern, since it is chiefly to this town that the traffic of the North converges.[*]

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[*] It has been remarked, and our own inquiry appears to confirm the fact, that a circle described of 70 miles radius from Manchester as a centre, embraces as large a population as an equal circle described from London as a centre, and as the former population is almost entirely engaged in manufactures, and a large portion of the working classes is in a great degree dependent on Irish agricultural importations, there must necessarily be a very extensive intercourse between Ireland and these northern counties, although we are aware that heavy articles would pass by Liverpool.

TABLE (C.)

Formed, in Progress, or to be Formed.	NAMES OF THE LINES			Length of Line Formed and in Progress.		Length of Line to be Formed.		Total Distance.	
				Miles.	Ch.	Miles.	Ch.	Miles.	Ch.
	Manchester, Chester, and Portdynllaen.								
		Miles.	Ch						
In progress -	Manchester to Crewe - -	38	28						
Ditto - -	Crewe to Chester - -	20	52						
				51	10				
To be formed	Chester to Portdynllaen - - -			- -	-	88	55		
	TOTAL from Manchester to Portdynllaen - - -			- -	-			139	65
	Manchester, Shrewsbury, and Portdynllaen.								
Formed and in progress.	Manchester to Wolverhampton -			70	0*				
To be formed	Wolverhampton to Portdynllaen -			- -	-	146	0		
	TOTAL from Manchester, *viâ* Shrewsbury to Portdynllaen -			- -	-			216	00

* This distance is derived, as in all other cases, by taking the shortest existing line, or lines in progress; but it has been suggested by Mr. Vignoles, in his Report to the Irish Railway Commissioners (p. 36), that a line might be made from Chester to Chirk, or Llangollen, to join the Shrewsbury and Bala line. This would essentially shorten the line of railway communication between Manchester and Portdynllaen, but, at the same time, it would increase the extent of the new line to be formed.

It is obvious that the advantage is in this instance in favour of the Chester line, whether Holyhead or Portdynllaen should become the packet station.

After a careful review of all the bearings of the case, we feel bound to state that the route by Chester, Bangor, and Caernarvon, is, under present circumstances, the preferable one for a railway communication to Portdynllaen.

It is now necessary to advert to the report of the officers of the Royal Navy, who were directed, in pursuance of the Address of the House of Commons of the 12th August, to give their opinion as to the relative merits of the three ports therein specified, namely, Holyhead, Portdynllaen, and Orme's Head.

In that report, dated the 14th January 1840, which has been officially communicated to us, we find that they consider the formation of a packet station at Orme's Head wholly out of the question; it therefore is unnecessary for us to make any further remark on that project.

If the Naval Committee were of opinion that the harbours of Portdynllaen and Holyhead could be rendered equally suitable for the station of the Dublin packets, it would be necessary for us to enter into the most minute and searching examination of all the properties of the two lines from Bangor, in order to ascertain to which the preference might be due. In this case we should require the advocates of these competing lines to lay before us detailed estimates and drawings of every part of the work that their respective projects would involve, with other information, to which it is now superfluous to advert.

The Report of the Naval Committee is, however, so decidedly in favour of Holyhead, that it is unnecessary to put the parties in question to the expense of preparing the drawings, &c. we have alluded to, because, although we are, for want of this minute information, not in a situation to state which of the two lines would be preferred—seeing that the advantages and disadvantages are nearly balanced—we yet are enabled distinctly to say that there is no mechanical or statistical superiority, in one line over the other, that could turn the scale against either harbour that might be considered the most advantageous for the packet station.

We have now to state, that in obedience to the order of the Lords Commissioners of the Treasury, dated the 12th of February last, we have carefully considered the arrangement submitted to their Lordships by the Naval Committee, for the proposed extension of the harbour at Holyhead; and we have to report, that so far as we are competent to judge of this matter, it appears to us that the project in question is well adapted for effecting the object which these officers represent to be necessary.

The following Table will show that even if the harbours of Holyhead and Portdynllaen had been equally favourable for a packet station, still a little time would be gained by selecting the former place as the point of departure of the Dublin packets.

TABLE (D.)

		Distance to the Packet Port by Railway from London.	Assumed Time required to perform the distance, at 25 miles per hour.	Length of Sea Voyage	Time required to perform the Voyage, at a rate deduced from the Voyages performed between Kingstown and Liverpool by H. M. Steam-vessels the Urgent, Merlin, and Medusa.	Time expended between the Post-offices and the Railway Stations in London, Kingstown, and Dublin, &c.	Total average Time expended between the London and Dublin Post-offices.
London and Dublin by Holyhead.				†		*	
Length of line already formed, viz. from London to Crewe -	M. Ch. 165 49						
Forming from Crewe to Chester - -	20 52						
	186 21						
Remaining to be formed from Chester to Holyhead - -	85 0	M. Ch.	Hrs. Min.	Miles.	Hrs. Min.	Hours.	Hrs. Min.
		271 21	10 51	63	5 38	1¼	17 44
London to Dublin by Portdynllaen.							
Length of line already formed, viz., from London to Chester	186 21						
Remaining to be formed from Chester to Portdynllae -	88 55						
		274 76	11 0	70	6 16	1	18 16

* In this column an allowance of a quarter of an hour is made for getting from the London post-office to the railway station, a quarter of an hour for passing the Menai Bridge, a quarter of an hour for embarkation, and half an hour for disembarking and travelling between the Kingstown and the Dublin post-offices.

† The length of the sea voyage is taken in each case from the map published in the Report of the Irish Railway Commissioners.

No allowance is made for the effect of prevailing winds, as we do not observe any important difference in the average time of the voyages between Liverpool and Kingstown performed by the first-class Government packets mentioned in the heading, whether in going to, or returning from Ireland.

The result of our inquiries may now be briefly summed up.

Holyhead being selected as the port for the Dublin packets, we are of opinion that the best line of railway for the communication between London and Dublin is that proposed by Mr. George Stephenson, namely, by Chester and Bangor to Holyhead.

If Portdynllaen had been considered the preferable station for the packets we should have recommended that the railway should be formed from Chester by Bangor and Carnarvon to Portdynllaen. In either case the line of railway might be completed in about three years from the period of its commencement.

We cannot close this Report without observing that from the favourable nature of the country for a railway from the Great Western at Dudcot to Oxford, and thence to Worcester, and from the skilful manner in which it is proposed to extend the line to the last named city, we are of opinion that at no distant period this project will be carried into effect.

This line would take from Oxford nearly a central course between the Birmingham and Great Western lines, and afford railway accommodation to a district which cannot derive much advantage from any other line.

This convenience would extend even to Worcester, notwithstanding that the Birmingham and Gloucester Railway will pass at no great distance; for the length of the journey from London round by Birmingham will be at least 138 miles, whereas, by the projected line through Oxford to Worcester, it would only be 118 miles—a difference of 20 miles in favour of the latter; and taking into account the greater average speed of the Great Western, there can be no doubt that at least one hour in time would be gained between London and Worcester, and the traveller would save from 5 *s.* to 6 *s.* in his fare.

In cases of emergency also, a much higher speed is, unquestionably, attainable on lines of this construction, than on those of the more usual gauge.

In conclusion, we have only to state that the continuation of the railway to Tenbury and Ludlow would not be prevented by any difficulties of construction, and if future researches should lead to the discovery of an easy passage through the mountains, the line may be eventually extended to the Welch coast.

We have, &c.
Frederic Smith, Lieut.-col. Royal Engineers.
Peter Barlow, F. R. S.

To Robert Gordon, Esq. M.P.
Secretary, Treasury.

Henry Amsinck,
Secretary, Lieutenant, R. N.

Appendix (A.)

REPORT upon the CHESTER and HOLYHEAD RAILWAY for effecting the best Communication between *London* and *Dublin*, and between *Birmingham*, *Manchester*, *Liverpool*, and *Dublin*; by Francis Giles, Civil Engineer.

AMID the general activity that has prevailed in the projection and construction of railways for improved communication in England and Ireland, one of the most important is still in abeyance—that for perfecting the transit of mails and passengers from London to Holyhead, and by the aid of an improved sea passage to Dublin, so as to render that line the concentrated channel of connexion between England and Ireland.

Three plans have been suggested for effecting this object:

One, by railway from London to Chester, thence to Flint, Conway, Bangor, and Holyhead, and by sea from Holyhead to Dublin.

A second, by railway from London to Shrewsbury, and thence to Llangollen, Bala, Barmouth, Portmadoc, and Portdynllaen, and by sea from the latter place to Dublin.

A third, by railway from London to Liverpool, and by sea from Liverpool to Dublin.

Parliamentary authority has been granted to the public for completing a railway from London to Chester, to which place (pursuing the line of the Grand Junction Railway) the distance from London is 184 miles; but it is confidently expected that the sanction of Parliament will soon be given to the Rugby and Stone Junction Railway, whereby the distance from London to Chester will be reduced to 178 miles.

Adopting, therefore, this latter course to within three miles of Chester, I have found, from my own surveys, that the remaining distance to Holyhead will be 87 miles, making the total distance from London to Holyhead 262 miles, and from whence the sea distance to Kingstown at Dublin is 63 miles. The country between Chester and Holyhead will afford planes nearly horizontal for 57 miles, and nothing steeper than one in 330 for the remaining 24 miles.

The formation of this line as far as Conway, a distance of 46 miles from Chester, will be very easy, but from Conway to Holyhead it will be formidable, though very practicable. At Conway I propose to cross the river by means of a new bridge, to be erected above the site of the present suspension bridge. At the mountains of Penman Bach and Penman Mawr two tunnels will be necessary, each about a mile in length. After passing these and proceeding south of Penrhyn Castle and the town of Bangor to the Menai Bridge, two considerable viaducts and two other tunnels, one a mile and a quarter, and one three quarters of a mile, must be encountered; but all these tunnels will be through rock, and perfectly secure. At the Menai Bridge I propose to draw the carriages over by a rope, to be worked by a stationary engine, after having detached the locomotive. This would only monopolize one roadway of the bridge, leaving the other still for the road traffic. From the Menai Bridge to Holyhead the line will consist of alternate cuttings and embankments, with two short tunnels, one on either side of Maldraeth Marsh.

By this route the time to be employed in travelling between London and Holyhead, at the rate of 27 miles an hour, will be nine hours and a quarter, to which must be added a quarter of an hour for getting from the London Post-office to the railway station, a quarter of an hour for passing the Menai Bridge, and a quarter of an hour for embarkation at Holyhead, which will be at six o'clock in the morning, five hours and a half for the average sea voyage to Kingstown, and half an hour from Kingstown to the Dublin Post-office; making altogether 16 hours; so that the mails leaving London at eight o'clock in the evening would be at the Dublin Post office by 12 o'clock the following day, and the return post from Dublin that evening (if dispatched by seven o'clock) would arrive early the next morning at Liverpool and Manchester, and in London by 11 o'clock.

The London mail, in its way to Chester, will gather all the mails of the southern and eastern, the midland, and the greater part of the western counties, while the Manchester train will embrace Yorkshire and the north-eastern districts; the Liverpool and Lancaster train also bringing their portion of the north, all which can reach Chester during the night, and proceed from thence about three o'clock in the morning with the London train to Holyhead.

The second project under consideration is the line by way of Shrewsbury, Llangollen, Bala, and Portdynllaen. (*See* the Report of the Commissioners for Railways in Ireland.) This is started by assuming a railway to be completed, as will eventually be the case from London to Shrewsbury, a distance of 153 miles*, having no gradient upon it steeper than 1 in 330; there then remains to be executed the remaining length of 112 miles, making the total distance between London and Portdynllaen 265 miles; this is stated in the above report to be only 260 miles, but from the map annexed to that report, it measures 265 miles.

This line from Shrewsbury to Portdynllaen has one gradient of 1 in 150 for 10 miles, and another, 1 in 211, through a tunnel of two miles in length; the remaining gradients are stated to be very good, but as the line has not been surveyed between Shrewsbury and Llangollen the particulars of that part are not given.

The sea distance from Portdynllaen to Kingstown is 70 miles.

As to the engineering qualities of this line, it appears from the Commissioners' Report that there will be great difficulty in passing Barmouth Harbour, after which a short tunnel, near Dolgelly, and a viaduct of extraordinary dimensions will be requisite. There is the tunnel, also, of two miles in length at Bala, and I should imagine that the line from Llangollen to Shrewsbury will be very heavy and expensive.

The time occupied by railway from London through Shrewsbury to Portdynllaen, at the distance of only 265 miles, must be above 10 hours, on account of the steep and obstructive planes and curvatures through Wales, to which add a quarter of an hour for getting from the London Post-office to the railway station, a quarter of an hour for embarkation at Portdynllaen, six hours for the average sea voyage to Kingstown, and half an hour from Kingstown to the Dublin Post-office, making altogether 17 hours at the least, being an hour longer than by way of Chester and Holyhead (but this may more probably be 18 hours); to which add the disadvantage of the position of Shrewsbury compared with Chester for concentrating the mails of the north with those of the south, east, and west of England for Dublin, together with the heavy cost of constructing the line from Shrewsbury to Portdynllaen, and afterwards of working the traffic upon it.

From London to Liverpool, the railway, comprising a distance of 210 miles, is in operation, having easy levels from London to Warrington, but from Warrington to Liverpool it encounters planes of 1 in 85 and 1 in 89, though these latter planes may be ultimately amended, and seven miles of distance saved by an improved passage of the river Mersey; a further distance of six miles may be also saved by the adoption of the Rugby and Stone line, in which case the final distance from London to Liverpool will be 197 miles. From Liverpool to Dublin the sea voyage is about 130 miles, requiring, according to the Report of the Commissioners for Railways in Ireland, a mean time of 13½ hours for the passage, but I will assume this to be ultimately only 12 hours. It must be remembered also, that during storms and low-water times vessels encounter much danger and delay in entering and leaving Liverpool harbour.

It is said that between Holyhead and Dublin no packet has been known to have been lost in the memory of man.

The time by railway from London to Liverpool, assuming the distance to be eventually 197 miles, will be about 7¼ hours, at the rate of 27 miles an hour, to which add one quarter of an hour from the London Post-office to the railway station, half an hour from the Liverpool station to the shore and embarkation, 12 hours on the average for the sea voyage from Liverpool to Kingstown, half an hour from Kingstown to the Dublin Post-office, making altogether 20½ hours, and consequently arriving in Dublin at half-past four o'clock in the afternoon, which will be too late for delivering letters, and obtaining the return from Dublin to England that night; moreover, in bad weather the arrival in Dublin must be too late for any delivery, or for any despatch of English mails into Ireland that night; whereas by way of Holyhead the arrival in Dublin can always be secured during fair weather, and rarely failing in bad weather in time for the return post of England, and eventually by means of railways from Dublin through Ireland, to reach Waterford, Cork, Limerick, Galway, and Belfast, in the next evening after leaving London.

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* It will be seen that the numbers assumed by Mr. Giles, do not in all cases agree with those which we have found on a careful inquiry to be correct.

It must also be remarked, that the early hour for embarkation and departure from Liverpool, which will be about four o'clock in the morning, renders it in winter very disagreeable, not to say hazardous.

The result of the foregoing comparison giving the preference in point of time and position to the line by Chester and Holyhead, the next question to be considered is, how the funds can be raised for carrying out the work, and what are the means of remuneration.

In the event of Government undertaking it, money could be borrowed under national security at 3½ per cent.; but it is contrary to the practice of Government to construct and take charge of such works; the public are, at the same time, reluctant to embark in them, unless a return of more than five per cent. can be calculated upon. Much difficulty appears, therefore, to exist in obtaining support to this project, and renders an investigation of the expected traffic necessary; but in the absence of a correct knowledge of the traffic, and assuming the cost of the railway (87 miles in length) to be 2,500,000 *l.*, including its stations and carrying establishment, I will, in the first place, suppose a gross receipt of about 200,000 *l.* a year necessary for the purpose of paying five per cent. upon the capital, and for maintaining the railway and paying carrying charges.

This yearly income of 200,000 *l.* may be expected from the following sources: viz. 30,000 *l.* a year from the Post-office, for conveying the mails; 70,000 *l.* for 200,000 second-class passengers, at 7 *s.* each, or nearly 1 *d.* per mile; 50,000 *l.* for 100,000 first-class passengers, at 10 *s.* each, or nearly 1½ *d.* per mile; and 14,000 *l.* for 20,000 mail passengers, at 14 *s.*, or nearly 2 *d.* per mile; the latter being a separate train, taking only the mail and its passengers and parcels: 50,000 *l.* per year may also be added for parcels and extra luggage. The Dublin and Manchester communication would adopt the route by Chester and Crewe, in preference to Liverpool.

In order, then, to facilitate the accomplishment of the railway, and, at the same time, to render more certain the payment of five per cent. to the shareholders, I propose to raise only 1,250,000 *l.* in shares, and 1,250,000 *l.* by loan from Government at three and a half per cent. as a first lien upon the undertaking; the redemption of this loan to be effected out of the surplus income, after paying the shareholders five per cent. Government will thus have as their security not only a priority of claim upon the railway income, but an additional hold upon it of 30,000 *l.* a year as the charge for conveying the mails, together with an immediate bonus accruing to the country from the diminished expense consequent upon simplifying the Post-office service between England and Ireland, through the medium of this undertaking; to which may be added, the general national advantages resulting from it.

If Government, therefore, lend this sum of 1,250,000 *l.*, and that in equal instalments with those which may be made by the advances of the company, the burden to the shareholders of providing all the capital will be relieved; and assuming, upon the foregoing low scale of charges, that the income of only 200,000 *l.* a year could be realized now, such charges will most likely attract and establish the travelling between England and Ireland chiefly upon this railway; hence the prospect of its paying by increased traffic a further dividend to the proprietors. In addition also to the present traffic, a still greater increase may be looked for when railways are made from Dublin to the distant towns of Ireland, by which means Dublin will become the principal entrepôt for the communication between Ireland and England. The improving trade of North Wales, particularly of Anglesea, Carnarvon, Bangor, Conway, and Flint, and probably a new trade from the proposed harbour at Orme's Head, called St. George's Harbour, will eventually produce an increase of revenue upon this line.

The comparison of the charge for the journey from London to Dublin, by way of Liverpool and by way of Holyhead, will stand thus:

The railway distance from London to Liverpool is now 210 miles, although likely to be reduced to 203 miles by an improved crossing of the Mersey, while the distance from London to Holyhead, through Chester, will be 262 miles, leaving a railway distance, eventually, of 59 miles in favour of Liverpool, which, at 1 *d.* per mile for the second-class passenger, is 4 *s.* 11 *d.*, and for the first-class passenger 8 *s.*; a difference that will be met by the cheaper voyage between Dublin and Holyhead against that between Dublin and Liverpool. Grounding the charge of these voyages upon the actual cost, and assuming, as I do, that the Irish travelling to and from England will be attracted by way of Holyhead, there will not be wanting steam-boat companies to work the Dublin and Holyhead passage at the charge of 5 *s.* for steerage and 8 *s.* for cabin passengers.

The mail packet might also be worked under contract by a company in connexion with the mail passengers' packet, and the Admiralty Packet establishment at Holyhead thus superseded.

Having thus shown, first, that the journey by way of Holyhead will, in point of time, supersede the journey by way of Liverpool, and that the total charge by Holyhead will be quite as small as by Liverpool, to which I may add, the great benefit of a short and safe sea voyage against one twice as long and more hazardous, I submit that my case for the line by Chester and Holyhead can be substantiated, and that the public, assisted as I have herein proposed, by Government loan, will be induced to accomplish it.

While this work is being executed, the London mail should be carried by railway to Chester, and thence by coach road to Holyhead. This is assuming the Crewe and Chester Railway to be finished.

This conveyance will bring the mail to Holyhead from London by twelve at noon, and consequently to Dublin, by improved packets, at five or six o'clock in the evening, while by way of Liverpool it cannot, on the average, reach London sooner.

(signed) *Francis Giles.*

Appendix (B.)

REPORT of Mr. *George Stephenson*, Civil Engineer, to the Directors of the Chester and Crewe Railway.

Gentlemen,

I HAVE now more minutely examined the route from Chester to Holyhead, which I recommended to you in my Report of the 19th December 1838.

The levels have been taken and sections prepared of the whole line: I have also had levels taken from Portdynllaen to Chirk, along the route recommended for serious consideration in the Report of the Irish Railway Commissioners, and shall now lay before you a statement of the merits and demerits of each line in detail, which will show how far my former observations are borne out by the actual result of the levels.

I shall now describe the route of the Holyhead Railway from Chester. The line should commence at the junction of the Chester and Crewe Railway with the Chester and Birkenhead Railway, and passing under Northgate-street, cross the canal at the south side of the dock and the river Dee: it then runs nearly parallel to the river, through Flint, Bagillt, Greenfield, by Mostyn Quay, and pursues its course a little inland, round the flat land, avoiding Talacre Park to Rhyl, where it crosses the river Toryd; from thence across the marshes, near Abergele, and nearly parallel to the turnpike road, leaving the Great and Little Orme's Heads a little to the right, and taking the low grounds by Nant to Conway; it then crosses the river Conway about 400 yards to the south of the bridge, and underneath the castle wall on the west side of the town; then runs parallel to the turnpike road, which it crosses near the toll-bar, and continues its course over Conway Marsh until it reaches again the coast near Penman Bach. At this place a tunnel will be required, passing through the projecting rock, of 500 yards in length; the line then takes the margin of the coast to Penman Mawr, continuing along the beach at this place for a short distance; it then leaves the coast and passes below Aber in a very direct line to the corner of Mr. Pennant's park wall, and under the turnpike road; thence in a direct line to Bangor, 490 yards of tunnel will be required before entering the town. Castle-street is next crossed over in open ground, and a short valley brings the line to the ridge dividing the Menai Straits from Bangor; it then bends round to the west, and continues nearly in a direct line to the bridge.

The route through Anglesea commences at the north side of the bridge, and continues on the east and north side of the turnpike road for about a mile, when it crosses under the road and continues its course over the marshy ground between the Monument and the Marquis of Anglesea's Lodge to Plas-llangaffo, running down to Maldraeth; it then passes to the east of Aberffraw, above Llyn Goram to Llanfaelog; the line then crosses the Stanley Sands, and runs parallel to the turnpike road into Holyhead.

I propose the station to be near the Royal Hotel, at the entrance to the town, but the line to be continued forward to the end of the pier if necessary, this part being worked by horses.

The route I have above described varies little indeed from that given in my former Report, the only variations being that the line is taken nearer the sea at Rhyl, and in a more direct course through Bangor.

I shall now describe the nature of the works on the section throughout the whole of the line.

The line will leave the Chester and Crewe and the Chester and Birkenhead Railways on the level, and continue towards Northgate-street, through a cutting half a mile long in the sand-stone rock, averaging 20 feet deep, then tunnelling under the street for 220 yards, it crosses 12 feet above the Ellesmere and Chester Canal; to this point the line is falling 1 in 272, or 19 feet per mile, for a distance of 68 chains; it then becomes level for 40 chains, crossing under the city walls, over the low ground, the two Crane-streets and Paradise-row, about 30 feet high, and by the south side of the ship-yard to the Dee; it then crosses the river about 30 feet above high water, and passes through the high ground opposite Brewer's Hall, in about 30 feet cutting, for a short distance, and on to the low ground nearly opposite the Upper Ferry; this distance of about two miles falls at the rate of 1 in 422. The next $8\frac{5}{8}$ miles are level, passing nearly on the surface of the ground, with very light work, by King's Ferry and Connah's Quay to near Flint.

In passing through Flint, the line rises for half a mile 1 in 440, or 12 feet per mile, and for half a mile falls 1 in 440, or 12 feet per mile, so as to get over some roads.

The next 26 miles are level. In passing Mostyn Quay, a short cutting into the rock to get under the tramway will be required, and also a diversion of the turnpike road; from this to Abergele the line passes nearly on the surface of the ground, and at Foryd the river will be passed over by a wooden bridge.

Two miles beyond Abergele a cutting will be required for a short distance, about 40 feet deep.

The railway at Llandulas will be passed under, and the line then passes along the beach and by a tunnel through Penman Head for 330 yards, where it takes the beach again for a mile, and begins to rise for $1\frac{1}{3}$ miles at the rate of 1 in 440, or 12 feet per mile; the work on this portion very light. The next $1\frac{1}{2}$ miles fall at the rate of 1 in 440, or 12 feet per mile, with some cutting, the heaviest part 30 feet for a short distance. The next $1\frac{3}{4}$ miles are level, and run nearly on the surface of the ground; the line then runs $2\frac{1}{3}$ miles, at the rate of 1 in 528, or 10 feet per mile, passing over the Conway 14 feet above high water, the same height as the present bridge: this crossing is much more favourable than I had anticipated. The line then approaches Conway, passes under Rosemary-lane and Upper Gate-street, and through the gardens between the walls, the extreme depth of cutting being 37 feet. The ground here presents much fewer difficulties than I had expected.

From the crossing of the turnpike road the line falls for two miles at the rate of 1 in 528, or 10 feet per mile, through a tunnel of 500 yards in length at Penman Bach; the next $2\frac{3}{4}$ miles to Penman Mawr are level. Some sea-walling will be required here, varying from 15 to 20 feet in height. Past Penman Mawr to the river Llanfair, a distance of $1\frac{3}{4}$ miles, the line rises at the rate of one in 440, or 12 feet per mile. In passing Penman Mawr, sea-walling will be required for nearly three quarters of a mile, varying from 15 to 20 feet in height. The line then descends for $1\frac{1}{3}$ miles at the rate of one in 440, or 12 feet per mile, and 54 chains of level brings the line near to Aber.

The next $4\frac{1}{3}$ miles rise at the rate of 1 in 330, or 16 feet per mile, the greatest part of which will be easy of execution; passing 18 feet under the turnpike road at Penrhyn Park corner, thence over the river Ogwen, 37 feet high, and into cuttings five-eighths of a mile long, and 45 feet deep.

In this cutting the Holyhead road and the railway from the slate quarries are passed under; this is one of the parts in my former Report that I considered the most expensive, as I then imagined the formation to be hard slate, whereas I now believe the whole to be gravel of the very best description for ballasting the road, great part of which will be required for that purpose.

The line then passes over the river Cagen, with an embankment about 350 yards long, and the extreme height 75 feet; we then come to the ridge which lies to the south of Bangor, where a tunnel will be required 490 yards long. We then cross 35 feet over Castle-street, in Bangor, and embank over the valley for about a quarter of a mile, the greatest depth being 70 feet.

The ridge between Bangor and the Menai Straits is next approached; the work here is of a much easier description than I had anticipated, open cutting only being necessary, whereas I stated in my former Report that a tunnel 400 yards long would be required. The inclination of the line from the river Cagen to the Menai, a distance of two miles 55 chains, is rising at the rate of 1 in 1,760, or three feet per mile. A short distance before reaching the bridge, the turnpike road will be passed under.

I shall now describe the nature of the works through Anglesey. Beginning at the toll-bar, a short cutting will be required approaching the ravine, which is about a quarter of a mile in width, and the average height of embanking across which will be about 40 feet. The material necessary for its formation is obtained from the cutting on the north side of the turnpike road.

The turnpike road will now be passed under, at one mile from the toll-bar, and to this point the line will be level. The next $2\frac{1}{2}$ miles rise at the rate of 1 in 440, or 12 feet per mile, very little work being required in the formation of the railway. The next $5\frac{1}{2}$ miles descend into the centre of the marsh, at the rate of 1 in 403, or 13 feet per mile; $2\frac{1}{3}$ miles of the first part of this distance is very easy of execution. The next $1\frac{3}{4}$ miles will be in cuttings, varying from 15 to 40 feet, which is the deepest at the road at Plas Llangaffo; the remaining $1\frac{1}{4}$ mile will be embankment, varying from 30 to 45 feet in height. The next $2\frac{1}{2}$ miles rise 1 in 330, or 16 feet per mile; one mile of this length will be embankment, varying from 30 to 45 feet in height. The low ground over which the above embankment is carried is the great marsh called Maldraeth. It may be considered by some that it would not be sound enough to carry an embankment of the height described. I am quite confident, however, that there are no grounds for apprehending any danger from this cause.

On the north side of the marsh the heaviest cutting in Anglesey is approached; it is a mile in length, 78 feet deep at the highest point, and averaging about 40 feet; it is of very hard material, but being in an open cutting it will be much more easily managed than if it had to be tunnelled through; the whole of the material will be required for making the embankment across the marsh. After leaving the above cutting, the next $1\frac{3}{4}$ miles rise one foot, and in this distance an embankment will be required for three-eighths of a mile, averaging about 25 feet in height.

The next $3\frac{1}{2}$ miles fall at the rate of 1 in 377, or 14 feet per mile, passing Llanfaelog. For the whole of this length, about an equal quantity of cutting and embankment occurs of a moderate description.

The line then runs to Holyhead, with inclinations varying from five to eight feet per mile, a distance of seven miles; the country slightly undulating for this distance, and the works of an easy description. The termination of the line will be on the level of the ground near the Royal Hotel, and the line to the packet station will be upon the surface of the ground.

RECAPITULATION of the LEVELS from *Chester* to *Holyhead*, showing the Rise and Fall.

HOLYHEAD INCLINATIONS.

LOCATION.	Distance from Holyhead.		Length of Plane.		Rate of Inclination.	Feet per Mile.		Rise of Plane.		Fall of Plane.	
	Miles.	*Ch.*	*Miles.*	*Ch.*		*Ft.*	*In.*	*Ft.*	*In.*	*Ft.*	*In.*
	1	40	1	40	1 in 660	8	0	12	0	—	
	3	40	1	40	1 in 880	6	0	-	-	9	0
Near Llanfaelog - -	7	00	4	00	1 in 1,056	5	0	20	0	—	
	10	40	3	40	1 in 377	14	0	49	0	—	
	11	67	1	27	1 in 7,072	0	9	-	-	1	0
Maeldraeth - - -	14	27	2	40	1 in 330	16	0	-	-	40	0
	19	67	5	40	1 in 403	13	1	72	0	—	
	22	27	2	40	1 in 440	12	0	-	-	30	0
	23	31	1	04	level.	—					
	23	51	0	20	Menai Bridge.			—			
Bangor - - -	26	26	2	55	1 in 1,760	3	0	-	-	8	0
Aber - - - -	30	66	4	40	1 in 330	16	0	-	-	72	0
	31	40	0	54	level.	—					
Llanfaer - - -	32	60	1	20	1 in 440	12	0	15	0	—	
	34	40	1	60	1 in 440	12	0	-	-	21	0
	37	28	2	60	level.	—					
Conway - - -	39	20	2	00	1 in 528	10	0	20	0	—	
	41	40	2	20	1 in 585	9	9	-	-	22	0
	42	60	1	20	level.	—					
	44	40	1	60	1 in 440	12	0	21	0	—	
	46	00	1	40	1 in 440	12	0	18	0	—	
	72	00	26	00	level.	—					
Flint - - - -	72	40	0	40	1 in 440	12	0	6	0	—	
	73	00	0	40	1 in 440	12	0	-	-	6	0
Upper Ferry - -	81	50	8	50	level.	—					
	83	50	2	00	1 in 422	12	6	25	0	—	
	84	10	0	40	level.	—					
TOTAL Railway to make	85	10	0	68	1 in 227	19	0	16	6	. .	

PORTDYNLLAEN.—INCLINATIONS TO THE TUNNEL.

LOCATION.	Distance from Portdynllaen.		Length of Plane.		Rate of Inclination.	Feet per Mile.	Rise of Plane.	Fall of Plane.
	Miles.	*Ch.*	*Miles.*	*Ch.*		*Feet.*	*Feet.*	*Feet.*
Length of 1st plane from Portdynllaen - -	3	00	3	00	1 in 720	$7\frac{1}{5}$	22	—
Pwllheli - - -	8	00	5	00	1 in 367	$14\frac{5}{12}$	- -	72
	14	00	6	00	level.	—		
	19	12	5	12	1 in 1,043	$5\frac{1}{12}$	26	—
Tremadoc - - -	22	12	3	00	1 in 804	$6\frac{7}{12}$	- -	23
	24	00	1	68	1 in 3,161	$1\frac{3}{5}$	- -	3
	32	40	8	40	level.	—		
	46	40	14	00	1 in 462	$11\frac{5}{12}$	160	
	56	54	10	14	1 in 150	$35\frac{1}{5}$	360	—
N. E. end of Tunnel -	58	54	2	00	1 in 211	25	50	—
Wolverhampton - -	87	26	—					
TOTAL Railway to make	46	00	—					

Portdynllaen Railway.

Before commencing a description of the route from Portdynllaen to near Chirk, I may inform you that the additional information I have now before me, since my former Report, enables me to go much more into detail than I could do at that time.

My former Report stated that the country from Portdynllaen to near Tremadoc was tolerably favourable for a railway, and might be carried into execution at the average cost of railways. I now find, by the levels that have been taken, that this part of the line cannot be executed at anything like their average cost; in fact, this part of the line is fully equal in magnitude to the worst part of the Holyhead Railway.

The line commences at the Cliffs, near Portdynllaen, at 60 feet above high water, and passes by Pwllbeli, Tremadoc, Harlech, Barmouth, Dolgelly, and Drews-y-nant to Bala, passing on the south side of the lake, along the valley of the Dee, by Corwen, Llangollen, and Pontycystle to Chirk; thence to the Grand Junction Railway, near Wolverhampton.

I shall now describe the nature of the works. The line commencing at Portdynllaen is 60 feet above bigh water. An inclined plane will he required at this place, so as to get the goods from the low to the high level, which must be worked by a stationary engine. The first three miles rise at the rate of 1 in 720, or seven feet four inches per mile, with tolerably easy work; at this point, where the line begins to fall for five miles at the rate of 1 in 367, or 11 feet five inches per mile, a heavy ridge has to he encountered, through which there must be a tunnel upwards of a mile in length. Upon the section given in the Irish Report two ridges are shown, one of 105 feet and the other 96 feet deep, with a brook between; but this section can only be obtained by very sharp and inadmissible curves, and the tunnel above stated must be resorted to.

In approaching Pwllheli an embankment commences, varying from 16 to 34 feet deep, and extends nearly five miles, crossing the harhour of Pwllheli at 8½ miles from Portdynllaen, and interfering very injuriously with the present convenience of the harhour. Six miles from Pwllheli are level, with moderate work; the line then rises 5¼ miles, at the rate of one in 1,043, or five feet per mile. In passing Cricceath two ridges have to be encountered, one 60 feet, and the other 80 feet deep.

From this point to Tremadoc the line is particularly heavy, the cuttings being of considerahle depth and length, and tbe embankments in crossing two lakes of great height. For nearly two miles the cuttings are of the following depths: 68 feet, 52 feet, and 57 feet; the embankments over the lakes are 45 and 53 feet respectively, aud about 1¼ mile long. The whole of the cuttings here alluded to are of a very hard material.

The line falls past Tremadoc for three miles, at the rate of 1 in 804, or 6 feet 6 inches per mile. The crossing of Traeth-mawr, near Portmadoc, is the next work, and the height of embankment from 20 to 28 feet. The next 1¾ mile fall at the rate of one in 3,161, or one foot eight inches per mile. On crossing the Traeth-mawr a ridge presents itself, 200 feet high, which separates it from Traeth-bach; and, although it is mentioned in the section that this extraordinary cutting may he avoided by carrying the line round, on a curve, yet that curve is such that must preclude its being adopted; a tunnel half a mile long is therefore indispensable.

The Traeth-hach has now to be crossed, and is about the same length as the Traeth-mawr, the heigbt being from 18 to 20 feet. Leaving this a cutting 55 feet in depth, and about half a mile in length, hrings the line past Llanfihangel church to the flat marsh land below Harlech; 8½ miles past Harlech are level.

The flat ground extends from the Llanfihangel cutting for about three miles, which is very favourable. In approaching the estuary below Llanbedr the line passes under a cliff, the extreme height of which is 161 feet. Some portion of this may be avoided by curving, but about 200 yards of deep cutting or tunnelling must be adopted.

From the estuary favourable ground presents itself hy Llanduwe to Llanaber, and to near Barmouth, where a tunnel is necessary in passing the town. This has been reduced to half a mile upon the section, by cutting 80 feet, and 70 feet at each end; it is through very hard material, of the clay-slate formation. A sharp curve is necessary at both ends of the tunnel, extremely objectionable for locomotive engines, and the cutting in approaching and leaving it will vary from 100 to 60 feet. The line is now rising at the rate of 1 in 462, or 11 feet 5 inches per mile, for 14 miles. At the mouth of the tunnel a valley is crossed by embankment 63 feet high, and the line takes the sloping ground on the north-west side of the Barmouth river.

As far as Llanelltyd the section exhibits a favourable surface line; hut along this country a longitudinal section only does not at all give a correct description of the work necessary in the formation of the line. The ground slopes very steeply, and although the section shows only 16 or 18 feet emhankment, yet in many places it would be three times tbat height; and even to ohtain this section, the line must be very tortuous in its course, to suit the irregularities of the ground. At the crossing of the Maw Valley, near Dolgelly, is the greatest work on the line, as regards embanking or hridges. It is 170 feet in extreme height, and from bank to bank measures three-fourths of a mile. From this point the inclined plane commences, rising 1 in 150, or 35 feet 2 inches per mile, for 10⅙ miles. Tbe cutting through the ridge at Heugwrt is 75 feet in extreme depth, three-quarters of a mile in length; heyond which, hy adopting a tortuous course, a fair section of the line has been shown, but certainly no such section can be procured with curves suitahle for locomotive engines.

The works approacbing the tunnel are of immense magnitude. It appears from the levels I have had taken, that the summit cannot be passed at a less length of tunnel than three miles.

The nature of the material at this place sets at defiance the probability of making a tunnel, and there can be no way of getting over this summit but hy stationary engines and inclined planes.

The inclination through the tunnel is shown to be at the rate of 1 in 211, or 25 feet per mile, for two miles. The line then descends from the summit of the country, on favourable gradients, past Bala and Corwen, with work of ordinary description.

In approaching Llangollen, in the course of three miles three tunnels are necessary, of the length of half a mile, 27 chains, and a quarter of a mile, through material of a very hard nature.

It is stated that the inclinations need not exceed 12 feet per mile; but I find that 5½ miles must fall at the rate of 26 feet per mile. If the line were to follow the course of the river, it might be attained at about 12 feet per mile, but any one acquainted with the circuitous route of the river by Llangollen, must be aware that no line can be made to follow its course. I have, therefore, taken the line direct, as represented on the section.

From Llangollen to Chirk Aqueduct, the works are extremely heavy; and at the crossing of the Dee at Pontycysylte, very expensive works must be resorted to, the height being from 60 to 80 feet for about half a mile in length.

On the line from Chirk to Wolverhampton, a distance of 54 miles, no section is given in the Commissioners' report, nor have I considered it necessary to have it levelled, as they have not shown any route definitively fixed.

I know, however, enough of the country to state, that it is very rough, and that no railway could be made in that direction without an enormous cost.

Having now given a detailed account of the works to be executed upon the line from Chester to Holyhead, and also from Portdynllaen to Chirk, I shall endeavour to draw a comparison of the principal features of the two routes.

From Chester to Holyhead the line passes through a generally flat country, free from any serious difficulties of execution, and with curves and inclinations of a most favourable nature; while I must again repeat, that further examination and consideration have only proved to me that the works upon the line from Portdynllaen by Bala are of a nature that ought never to be attempted, and are totally impracticable, especially at the summit.

In point of distance of railway to be made, the Holyhead line has the advantage of having 61 miles less of railway to make:

	Miles.
From Wolverhampton to Portdynllaen	146
Great Holyhead Railway	85
	61

As regards the distance from London, in my former report the saving by the Holyhead line was only stated at two miles, in consequence of taking the Portdynllaen route at 260 miles, as given by the Irish Commissioners*, whereas it appears, from measurement, to be 272 miles, and the saving as 10 miles:

	Miles.
London to Portdynllaen, by Wolverhampton, Shrewsbury, &c.	272
London to Holyhead, by Rugby, Tamworth, Chester, and Bangor	262
Saving by the Great Holyhead Railway	10

The line by Chester runs in the most direct route to the manufacturing districts of Lancashire, Leeds, Hull, York, Sheffield, and the Staffordshire Potteries; while by the Shrewsbury line they are left many miles to the north.

On reference to the statement of inclinations, it appears that 40 miles of the Holyhead line are level, and only seven miles of the remaining 45 rising 16 feet per mile; the others varying from three to 12 feet per mile.

On the Bala line there are 10 miles rising 1 in 150, or 35 feet 2½ inches per mile, and two miles 25 feet per mile. The other parts vary from 1 to 14 feet per mile. From the very high country that the line passes over, there would be an additional loss of power, amounting to more than 20 miles of actual distance. It therefore appears to me that there can be no doubt as to which line ought to be adopted for the benefit of the public.

I have, &c.
(signed) *George Stephenson.*

Appendix (C.)

EXTRACT from Mr. *Vignoles'* REPORT to the COMMISSIONERS appointed to Consider and Recommend a General System of RAILWAYS for Ireland.

"STARTING from the cliffs near the extremity of the promontory at Portdynllaen, at an elevation of 70 feet above the level of the sea at low water, the general course of the line will be parallel to the Pwllheli road, with a gentle ascent for three miles, and over favourable ground. The heavy cutting in forming the spurs of the Rivel Mountains may be, probably, diminished on further examination in detail. A descent of about 14½ feet per mile, for five miles, brings the line close down upon Pwllheli, from which place to Clan-y-llynan, a distance of six miles, a horizontal line upon the sea shore is attainable. The earth-work shown on the detailed section beyond Pwllheli may be probably diminished in setting out the line, by occasional deviations. A gentle rise next commences and continues some distance beyond Criccieth, at which town the course of the line turns inland, towards the Tremadoc embankment, to which a gentle fall occurs, commencing about midway from Criccieth. After crossing the sands of Traeth Mawr and Traeth Bach, and the point of the peninsula between them, a horizontal line for nearly 10 miles has been laid out, running generally along the coast, past Harlech and Llandanwg to near Llanddwywe. The asperities of the section at the peninsula south of Tremadoc, and also between Harlech and Llandanwg may be much softened by deviations of the line, to keep lower down along the face of the cliffs, which run close to the sea shore.

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* Mr. Stephenson should have stated that this distance was given by Mr. Vignoles in his Report to the Irish Railway Commissioners.

"At Llanddwywe commences a rise of 1 in 462 (11 feet 5 inches per mile), which continues uniform for 14 miles. The line leaves the coast at Barmouth, and getting past that town by a tunnel of about half a mile, proceeds for several miles along the left bank of the Maw, or Mawddach River, but is finally compelled to cross that valley above the point where the River Onion unites with the Maw at the village of Llanelltid, about a mile west of Dolgelly, and where the road turns off to cross the river to Dolgelly and Drews-y-nant.

"The viaduct necessary here will be of a gigantic character, and of unprecedented height, but having eight miles of very favourable country on each side, the great cost of this construction (120,000 *l.*) will be spread over 16 miles of the railway adjacent, and the average expense of this portion of the line will not be so very materially increased. At the Llanelltid, or to use the name of a place better known, at the Dolgelly Viaduct, the inclination of 1 in 462 terminates, and a gradient rising 1 in 150 (35 feet 2½ inches per mile) commences, which is continued for upwards of 10 miles, generally keeping on the left side of the valley to about a mile beyond Drews-y-nant, where the summit tunnel begins. This tunnel must be two miles long; the inclination through it has been reduced down to 25 feet per mile, or 1 in 211; at its north eastern extremity the railway arrives at the summit, 590 feet above the sea at low water. From this point the descent begins to the east, and the gradient is 1 in 640, or 8½ feet per mile, along the south side of the Bala Lake to a mile and a half beyond the town of Bala, a distance of more than five miles, and where the detailed sections terminate, with the valley of the River Dee open, the course of which must be followed to Corwen, and from thence past Llangollen and the Pont-y-Cystle Aqueduct; and with the exception of some difficulties between Corwen and Llangollen, a line generally very favourable may be obtained, with gradients not exceeding 12 feet per mile, or 1 in 440.

"From the Pont-y-Cystle Aqueduct, the first series of exploring levels in continuation passed by Chirk, and parallel to the Ellesmere Canal; thence eastward to the north of Wem, and then by Newport to the Grand Junction Railway, in the vicinity of Brewood, north of Wolverhampton; but though a practicable line was to be obtained in that direction, it would be expensive, and I would recommend a very minute search to be made, both to the north and to the south of this route; on the north, in order to consider if it might not be advisable to unite with the Grand Junction Railway, to the north of Stafford, at the point where the new line to Manchester, through the Potteries, will branch off; and provided no material addition be made to the whole distance to London, such a point of junction might be advisable, as a considerable length of railway construction might be saved, and the packet line would be brought more centrally on to the Grand Junction Railway, and otherwise connect better with Manchester and the Potteries, &c.

"But more particularly should an examination be made to the south, to determine the practicability of bringing the important town of Shrewsbury within the range of the travelling line to Ireland, and of retaining its place on the main route from Birmingham and London.

"Some time since a railway was projected between Wolverhampton and Shrewsbury, but terminating, I believe, so as not to be well adapted, in respect of level and direction, for being extended towards the valley of the Dee. And it is conceived that it would be desirable to pass Shrewsbury on a high level, so as to soften the descent from the point of diversion south of the Ellesmere Canal.

"Such a route might probably be continued from Shrewsbury, down the right banks of the Severn, and pass opposite to Coal Brook Dale, and between Iron Bridge and Broseley, and then in a direct easterly course to join the Grand Junction Railway near the Wolverhampton station.

"Difficulties may doubtless arise on points of this route, but it has many advantages; and from the report of my assistants, I have reason to believe that such a direction for the Railway would not be more expensive than the line by Wem and Newport. No trouble should therefore be spared in endeavouring to fix the route to North Wales through Shrewsbury.

"To return to the line from Portdynllaen to Bala, the following is a List of the inclinations or gradients, commencing at the Packet Port, and terminating to the north-east of Bala, viz.:

STATIONS.	DISTANCES.				GRADIENTS.		Difference of Level.	Rise or Fall.	Height above the Sea at Low Water.
	From Portdynllaen.		Intermediate Distances.		Feet per Mile.	Ratio of Perpendicular to Base.			
	Miles.	*Ch.*	*Miles.*	*Ch.*			*Feet.*		*Feet.*
Portdynllaen - -	-	-	-	-	- -	- -	- -	–	70
Near west end of tunnel.	3	00	3	00	$7\frac{1}{3}$	1 in 720	22	R.	92
Pwllheli - -	8	00	5	00	$14\frac{5}{12}$	1 in 367	72	F.	20
Clan-y-llyan - -	14	00	6	00	- -	horizontal	- -	–	20
Near Morfa - -	19	12	5	12	$5\frac{1}{12}$	1 in 1,043	26	R.	46
Tremadoc embankment.	22	12	3	00	$6\frac{7}{12}$	1 in 804	23	F.	23
Llanfihangel - -	24	00	1	68	$1\frac{2}{3}$	1 in 3,161	3	F.	20
Llanddwywe - -	32	40	8	40	- -	horizontal	- -	–	20
Llanelltid - -	46	40	14	00	$11\frac{5}{12}$	1 in 462	160	R.	180
Near Drews-y-nant, at south-west end of the summit tunnel.	56	54	10	14	$35\frac{1}{5}$	1 in 150	360	R.	540
At north-east end of the summit tunnel.	58	54	2	00	25	1 in 211	50	R.	590
Beyond Bala - -	64	00	5	26	$8\frac{1}{4}$	1 in 640	44	F.	546

Appendix (D.)

Average Time of making the Voyage between *Liverpool* and *Kingstown*, derived from a Return, showing the Mean Time of Passage of Her Majesty's Mail Steam Packets, the Urgent, Merlin, and Medusa.

VESSELS.	From Liverpool to Kingstown.			From Kingstown to Liverpool.			REMARKS.
	Hours.	*Min.*	*Sec.*	*Hours.*	*Min.*	*Sec.*	
Urgent - - - - -	12	20	0	12	23	0	
Merlin - - - - -	11	35	17	11	11	17	
Medusa - - - - -	11	43	0	11	37	40	
÷ 3	35	38	17	35	11	57	
Mean Time - -	11	52	45	11	43	57	Which, for 130 miles, gives a rate of about 11 $\frac{1}{8}$ miles per hour.

Appendix (E.)

An Account showing the Number of Mail and Stage Carriages Licensed on the Lines of Road from *Shrewsbury* to *Llangollen*, *Bala*, and *Barmouth*; *Llangollen*, *Bangor*, and *Holyhead*; *Chester*, *Bangor*, and *Holyhead*.

Numbers of Plates.	FROM	TO	Number of Miles.	Journies per Week.	Number of Passengers Licensed to be Carried.
7217	Barmouth	Carnarvon	47	7	6
7265	Ditto	Ditto	47	7	6
7214	Chester	Ditto	70	6	10
7097	Ditto	Ditto	72	6	13
7092	Ditto	Llangollen	22	12	13
7129	Hartford	Carnarvon	90	7	13
7261	Ditto	Ditto	90	7	12
Two mails	Ditto	Holyhead	102	14	8
8129	Holyhead	Birmingham	150	7	10
8130	Ditto	Ditto	- -	7	10
	8129 and 8130 carrying the mail.				

Appendix (F.)

To the Provisional Committee of the proposed Railway from *Shrewsbury* to *Birmingham* and *London*.

Gentlemen,

Since I attended at Shrewsbury to receive your instructions relative to the proposed Railway communication with London, I have made a personal inspection of the country, and have enabled myself to lay before you the following observations for your consideration.

The subject is in many points of view of great importance, and I cannot properly discharge my duty to you without touching upon matters not specifically mentioned in your instructions, but which bear most materially upon the question before me.

Your object is to effect the best Railway communication between Shrewsbury and London; but you contemplate, I presume, the formation of a junction with some of the Railways already made. The neighbourhood of Wolverhampton appears geographically to be well suited for such a junction; but whether this is to be effected with the Grand Junction Railway, or the contemplated Wolverhampton and Dudley Railway, is a point which still requires to be determined.

You have already been in communication with that company, or rather the parties representing that company, and so far as I have been able to collect your views, you did this with the intention of rendering mutual assistance, and of ultimately blending the two into one concern; however this may be, I shall endeavour to show you, that what is termed the Dudley line will not answer all the purposes that you require from it. In the first place, that line terminates on the north-west side of Birmingham, at a level much above the London Railway, which is on the south-eastern side of the town; and thus the mode of connecting one line with the other, if not altogether impracticable, is at least too difficult and costly to be seriously contemplated. This circumstance alone would frustrate your own intention of forming a Railway communication with London; and had you been aware of this fact, you could not, consistently with that intention, have entertained the notion of a line by Dudley; besides the expense of forming such a line would be very great, the number of canals, tram-roads, steam-engines, mines, roads, &c., with which this district is intersected, would render the cost of formation far exceeding that of ordinary lines; and the precarious nature of the ground, which is in various places continually giving way, would render the maintenance of such a road still more difficult and expensive.

Fortunately for you, it is not necessary to depend upon the uncertain contingency of this line being made, there is a line already formed from Liverpool to Birmingham with which you can connect yourselves, and by which you can secure the best Railway communication with London; and setting aside all other questions than those already mentioned, there is sufficient reason to prefer a junction with the Grand Junction Railway; indeed, I may add, that it is the only line answering the condition set forth in your instructions. I do not of course mean it to be supposed that no other line can be found to join the London and Birmingham Railway, but any such line would be attended with some difficulty, and as it would in all probability run parallel to the existing line, there is no likelihood that it would ever be sanctioned by the Legislature. That the line by Dudley would be more costly than has been that of the Grand Junction Railway, I do not entertain the slightest doubt, neither do I question the power of the Grand Junction Company, on account of their great trade, to admit the trade of your line on more advantageous terms than could be afforded by the Dudley Company; and so far, too, as these considerations affect the question, the preference to the existing Railway is strengthened. Having therefore brought myself to this conclusion, I next considered the best point at which to form a communication with the Grand Junction Railway.

Having been most anxious to include the town of Wolverhampton, I devoted a considerable portion of my time to that part of the subject. There are great difficulties in reaching the higher ground on which Wolverhampton stands, besides a considerable detour in the line; but the extent of these difficulties, and the cost of reducing them, can only be determined when more accurate surveys are made.

It appears that you have already had this line surveyed, the section of which was placed in my hand; and although I was not enabled minutely to compare that section with the actual ground, I was the better enabled to estimate the difficulties which the line presented.

From this document I found it in contemplation to have a tunnel one mile and a quarter long, an inclined plane two miles long, rising 1 in 100, besides other heavy and very expensive works.

It would be difficult for me at present to say how far these works may be reduced, yet I may so far venture to express the belief that some considerable saving may be effected. This may be accomplished by changing in some places the direction of the line, and in giving a different distribution to the levels; but until a new section be taken, I cannot be expected to give more than an outline of the proposed alterations.

Beginning at Shrewsbury, near to the English Bridge or Abbey Foregate, the line will skirt the high ground near the Racecourse, and pass over the River Severn, near to Preston Boats, thence in nearly a direct line to Upton Forge, near to which place it will cross the River Tern, skirting the high ground by Walcott and Wrockwardine to Wellington, passing that town either on the higher or lower side, as upon trial may best suit the levels. The ground at the summit, near St. George's, is very high, and it is probable that a lower pass may be found, more to the northward, in which event the line would pass near to the four roads ends at Crackley Bank, thence by Woodside, Norton Meer, east of Tong, to High House Wood and Oaken, thence by Oxley to the Grand Junction Railway, near Snow Hill.

A trial, however, should be made of a line from High House Wood by Wergs and New Bridge to near Wolverhampton, and joining the Grand Junction Railway at the present station at Wednesfield Heath.

It may also be desirable to try a line passing nearer to Lilleshall and Blymhill and joining the present railway three or four miles further to the northward.

The merits of these various lines can only be determined by actual levels, and I shall content myself therefore with giving the suggestion, reserving my opinion until such levels have been taken as will enable me to give it on secure grounds.

The country itself is rather difficult, and requires to be well explored before any line be decidedly fixed upon; when that is done, the cost, as well as the relative advantages of each route, may then be determined.

I do not think it desirable, therefore, in the present stage of the proceeding, to do more than give this general outline of my views, which, if approved by you, I will more fully mature, and endeavour to obtain for you the best line that the country affords.

I have, &c.

London, 5 July 1838. (signed) *Joseph Locke.*

Appendix (G.)

TO Lieutenant-colonel Sir *Frederic Smith* and Professor *Barlow*.

18, Duke-street, Westminster,
11 April 1840.

Gentlemen,

In submitting for your consideration the sections of the proposed line from the Great Western Railway at Dudcot to the River Severn at Worcester, which, as you are aware, have lately been taken under my own immediate directions, as part of one entire line from London to the Porth Dynllaen, I shall with your permission extend such remarks as it may be necessary to make in explanation of them, to the several other detached surveys and sections which have been made, and which together constitute the line under consideration.

These sections have been laid before me, but I have not had the opportunity of making myself acquainted with the country by personal inspection.

It is much to be regretted that the surveys have been thus made in detached portions, and that so little time has been devoted to the examination of the country, part of which is of a nature peculiarly demanding repeated trials.

The sections now submitted are therefore, when compared with the well-considered lines projected in other directions, seen under every disadvantage, and I would beg to submit that they must be taken only as proofs of the perfect practicability of the line; and, as the slightest inspection of the ground must I believe have satisfied you, that great improvements could be effected at many places, it is fair to assume that generally a much better section could be obtained.

By the proposed route it appears that the total distance from London to Porth Dynllaen would be 260 ½ miles. Of this, about 40 ½ miles at the western extremity, namely, from Porth Dynllaen to Barmouth, consists of a portion of a line surveyed by Mr. Vignoles, and passing through Shrewsbury.

The gradients on this part are moderate, and may evidently be still further improved; the first plane of 14 feet 6 inches per mile being reduced to 10 feet per mile for six miles, and the terminating gradient to eight feet per mile, and there are no works of any extraordinary difficulty, as the only high embankment shown upon the section may be considerably lowered. Near Porth Dynllaen there would be a tunnel of one mile in length, at Porth Madoc another probably of about half a mile, and, at the back of the town of Barmouth, a third of half a mile in length. It is to be observed that the latter part of this line has been set out with the view of continuing it in the direction of Bala, and where it ascends to a very considerable elevation. In adapting it to a junction with the line surveyed from Barmouth to Newtown, which may be kept at a lower level, and which crosses the valley, it is probable that some advantageous modifications may be made in the section; the gradients at all events will be reduced to eight feet per mile. From Barmouth to Newtown, a distance of 40 miles, the country has been surveyed by Mr. Newnham; the ground is unquestionably difficult, and would have required very laborious and careful examination. As I have before stated, the time and means of the parties have not allowed of this, and after a hasty survey of the general features of the country, the present section was taken. Notwithstanding all these disadvantages, the section does not present any insurmountable difficulties, and even without making any allowances for those numerous improvements, which upon frequent revision of the ground cannot fail to suggest themselves, these difficulties appear to be limited to a small portion of the line, and to three principal works, namely, two viaducts, the one at Dolgelly, the extreme height of which would be about 100 to 120 feet, and the extreme breadth of the valley, part of which would be embanked, about 500 yards; the second over the River Dovey, the extreme height being about 160 feet, and the breadth of the valley from cutting to cutting about 770 yards, of which probably 200 yards would be embanked.

The third and most serious obstacle is in crossing the mountain range between Dolgelly and Dynas Mowddwy: at this point, according to the present section, a tunnel of 3 ½ miles in length would appear to be required, the principal difficulty in the construction of which would arise from the great depth of the shafts; but if very deep shafts are sunk and used for driving a heading out of the exact level or line of the tunnel, and from which heading the centre part of the tunnel might subsequently be formed, and the time and expense of raising the material thus avoided, much would be saved. By such an arrangement, if 10 yards per month be allowed for sinking the shafts and driving the headings, it would occupy about five years and a half; but a slight examination of the Ordnance map is sufficient to show that this difficulty may be much diminished in every respect. A line nearly parallel to that of the proposed tunnel, and at half a mile to the south-west, would appear to shorten the tunnel, while the depth of the shafts would undoubtedly be considerably less, while about half a mile further to the south, and running in a more westerly line, there is a pass through which the present turnpike road from Dynas Mowddwy to Dolgelly is carried, and I think there can be no doubt that if the section had been carried in this direction the depth of the shafts would have been comparatively small, while the distance would have been reduced nearly a mile.

Beyond Dynas Mowddwy there is a tunnel of 1,040 yards, and in which the ground admits of shafts of moderate depth.

At Blaen Teffallog there is a tunnel of two miles, or perhaps economy might be effected by even lengthening it to 2 miles 500 yards, so as to reduce the cuttings at either extremity. In this tunnel the ground admits of shafts being made wherever required. Near the upper extremity of the valley of the Afon Yal, near Carno, there is a fourth tunnel of 1,570 yards, but through comparatively low ground. This tunnel may easily be reduced to half the present length, by following rather more nearly the direction of the valley. There are two points where, according to the present section with the line of rails as marked in red, very deep cuttings would appear; but these gradients have been so laid down, because at both these points there is a choice of better ground. The first is between the crossing of the Nant Frith and the Afon Yal, opposite the town of Dynas Mowddwy, where the ground is sloping; the second is at the hill of Cwynfywydd, which may be passed to the south instead of the north. The works generally upon this section, with the exception of those above specifically referred to, are moderate, considering the nature of the country, and may be much further reduced when the line is more carefully laid out. The general character of the gradients of this portion of the line is a continued ascent, averaging 19 feet per mile for about 27 ½ miles to the summit, the total rise being 520 feet. The maximum gradient may be 21 feet per mile, or if short undulations are considered admissible, they will vary from 15 to 25 feet. The remainder is a descending plane of 20 feet per mile to the river Severn, at Newtown. I have referred to the practicability of passing the mountain range between Dynas Mowddwy and Dolgelly, with much less difficulty than appears upon the section now laid down; but there is also another route, by which this summit will be altogether avoided, and which is worthy of consideration, by descending the valley of the Afon Yal from the summit level of the present section, and thence by the valley of the Afon Twymyn unto the valley of the Dyfi or Dovey, by the town of Aber Dovey, thence up the coast across the Mawddach at Barmouth, and afterwards following the original line to Porth Dynllaen.

This deviation would involve an inclined plane from the summit level down the valley of the Afon Yal, and either a sharp curve of three quarters of a mile radius, or some new accommodation for the trade at Barmouth, as the passage of masted vessels up the river would be interrupted, if the river be crossed lower down to avoid the curve; but the extent of this trade is, I believe, very small. By this line, however, the distance would be increased about 7½ to 8 miles.

From Newtown, eastward, to Worcester, Mr. Varden has laid down a line, which, notwithstanding the shortness of the time allowed to him for examining the country (not quite three weeks), presents a very favourable section. Upon the whole distance of 61½ mile there are no tunnels necessary, neither are there any bridges of the class usually called viaducts; the maximum gradient is 20 feet per mile, which extends for a distance only of four miles; there is also a plane of six and a half miles in length, with a gradient of 19 feet per mile. There are five and a half miles at something under 18 feet per mile, seven and a half miles at about 16 feet per mile, and the remaining 33 miles consists of levels or low gradients. The maximum gradient, of 20 feet per mile near Onnybury, may be reduced to 18 feet by a slight increase (no where exceeding six feet) of the embankments, where the line is at present nearly on the surface of the ground, between the village of Bromfield and the town of Ludlow.

Near Tenbury, the works, although very light upon the present section, may be still further reduced, and the gradients (partly 16 feet per mile) be improved, by carrying the line at several points across the ground now occupied by a portion of the projected Leominster and Stourport Canal. This canal might be diverted, but as there is no prospect of its being completed, and there is consequently little or no trade upon it, it would probably be less expensive to close the part required for the railway, which would indeed be the means of giving trade to the remaining portion.

It must have been evident, upon your inspection of the country, that the deviations pointed out by Mr. Varden, as well as others which suggested themselves to you, are perfectly practicable, and would much improve the section, as well as the curves upon which these sections were taken.

The general direction of this portion of the line, commencing at Newtown, is by the valley of the Severn and the Mule to a summit at the Sarn, by the Cairbitra and Camlad valleys to Lydham, about one mile from Bishops' Castle, thence by the valleys of the Onny and Teme, and passing by the towns of Ludlow and Tenbury to Worcester. This district is rich in mines of lead, copper, coal, and iron, but which are rendered comparatively valueless by the want of the means of transport and communication.

At Worcester the line crosses the Severn at about 35 feet above the meadows.

From Worcester it is proposed to carry the line by the vale of Evesham to Oxford, and thence by the projected Oxford Branch into the Great Western Railway at Dudcot. A preliminary section was taken by Mr. Hennet in 1836–37, and a company proposed to be formed for the construction of this line, but the further progress of this plan, in common with that of most others projected at that time, was necessarily postponed, and until within the last few days no further examination of the ground has been made. The original section was taken round the north-eastern extremity of the Cotswold hills with the view of avoiding the necessity of any tunnelling, although involving an increase of distance, and consequently increased expense. During the present week, sections have been taken of a line through the hill at Chipping Camden, and which being, in my opinion, much better than the former line, I shall assume to be that now proposed, and shall proceed to describe it.

Commencing at the River Severn, and passing by the Diglis basin of the Worcester and Birmingham Canal at Worcester, it is carried through a short but deep cutting at Norton, crosses the Birmingham and Gloucester Railway, passes about 1½ miles north of Pershore by the village of Wyre Piddle, crossing the Avon at Fladbury, and again, close to Evesham, and sweeping round over a gently rising ground to the foot of the hill at Chipping Campden, the whole of the ground, with the exception of the short embankment across the valley of the Severn and the deep cutting above-named, and for a distance of 19½ miles, is extremely easy, and calls for no remarks. From this point the line rises by an inclined plane of 1 in 90, which is about the same gradient as that of the Rainhill and Sutton planes on the Manchester and Liverpool Railway. This plane will be four miles in length, and passes through the hill by a tunnel of 75 chains; from this point, which is the summit, the line proceeds over easy ground for about 3½ miles, then through a short but deep cutting, and by the town of Moreton-on-the-Marsh into the valley of the Evenlode, with very easy gradients and without any work of difficulty worthy of remark, to Oxford (the only exception being a deep cutting near Stow-on-the-Wold, to avoid some ornamental ground, and which would not exceed 180,000 cubic yards in amount), and is remarkable only on account of the smallness of the earth work. On the rest of the line from Moreton to Oxford, the general character of the gradients will be ascending from the river at Worcester for about three miles, at 16 feet per mile; descending about six miles with low gradients, about two miles of level, about 4½ miles alternately level and rising 10 feet per mile, and 3½ miles rising 12 feet per mile, to the foot of the inclined plane. The incline is shown on the section with a gradient of 1 in 90, or 58½ feet per mile, and a length of about four miles; about two-thirds of the length would be perfectly straight, and the remainder on a curve of four miles radius. For a distance of 5½ miles from the summit of the incline the line will undulate with gradients of 16 feet per mile, keeping nearly at the same general level, and thence descend to Oxford, with gradients varying between 5 and 10 feet per mile. From Oxford to the junction with the Great Western Railway, at or near Dudcot, the country is very easy. Two lines have been projected, and plans and sections of both have been deposited preparatory to an Act being applied for. The shortest of the two, and, when considered as forming part of a main line, the best, is 9½ miles in length; it is nearly straight, and the junction with the Great Western Railway would be effected with a curve of about one mile radius.

From Dudcot to London, the distance is about 52½ miles, making a total distance from the Severn at Worcester to London of 118½ miles. The gradients of the Oxford line are of the same character as those of the Great Western, and consequently these 62 miles may be considered as nearly level.

Taking the whole line from Porth Dynllaen to London, and dividing it into four portions according to the prevailing gradients, there will be in the first place about 41 miles nearly level, with a maximum gradient of 10 feet per mile, and that for six miles only, upon this division, therefore the gradients offer no obstacle to high speed. The next division, of 70 miles in length, and extending to the town of Ludlow, consists of a long ascending plane of 27 miles, with gradients of about 21 feet per mile, and a descending plane of 10 miles, with a gradient of 20 feet per mile. Thence ascending again for about eight miles, with gradients of 15 to 17 feet per mile, and after running nearly level for about nine miles, descending to Ludlow with gradients principally of 18 feet per mile. Upon this division are collected all the greatest difficulties, both of the works in the execution, and of gradients when completed; but it is on this division also that the survey requires and admits of the most improvement. From Ludlow the remaining distance of 149½ miles to London may be divided into two portions: the first extending to the proposed inclined plane, a distance of 50 miles, will consist of favourable gradients, the maximum being 16 feet per mile, and this upon three short planes, together only 6¾ miles, while upwards of 35 miles will consist of levels, or gradients not exceeding 10 feet per mile.

From the summit of the inclined plane to London, there will be a continuous line of 95½ miles with excellent gradients; the first few miles, indeed, have inclinations of 16 feet per mile, but these are short, and in either direction descend before ascending. With this exception, the maximum gradient is only 10 feet per mile, and upwards of 62 miles are either level or not exceeding four feet per mile.

The general character of the first, third, and fourth divisions, forming together 186½ miles, or nearly three quarters of the whole distance, is so nearly similar to that of the Great Western Railway, that it may be safely affirmed to justify in the fullest degree the same means adopted and in use upon that line for insuring the highest speeds, with a smoothness and security in the motion of the trains which certainly appear to be obtained by the increased width of gauge. Whatever may be the means by which the increased rate of speed is obtained, the experience of the working of that line proves that they are quite consistent with the utmost economy in the permanent working, which is a very material feature in the consideration of any line, but particularly of one so extensive and so calculated to comprise an immense traffic of every description as that now under consideration.

Assuming, therefore, an average speed of 36 miles per hour over the whole distance in the direction from London, and allowing a reduction to 25 miles per hour on the inclined plane in returning, the time occupied on the two journeys will be 14 hours 32 minutes, and which, with the time required for dispatch of mails to and from the post-office at either end, the passage across Channel, &c. will, I believe, still allow letters being received and answered at Dublin by return of post in the same day.

The increased probability of regularity in the passage between Dublin and Porth Dynllaen, from the course being so much less directly opposed to the prevailing and more violent winds, viz. the south-westerly, will, I suppose, be considered also as giving an advantage to this line over one leading to Holyhead.

Besides the peculiar advantages of directness and expedition offered by the proposed line, as regards the principal termini, a very large population, existing in its vicinity, will be supplied with that improved means of communication with the metropolis, the manufacturing districts, and the ports of the kingdom, which is absolutely necessary to them, and which other parts of the kingdom now possess.

Taking the districts comprehended between lines at about 10 miles on either side of the railway from Dudcot to Worcester, except when such boundary approaches to within a similar distance of the Birmingham or Cheltenham lines, and then taking only half the space between the two railways, and beyond Worcester to the boundary of Wales, a breadth on either side of 15 miles, and in Wales, including the counties of Montgomeryshire, Merionethshire, Caernarvonshire, Radnorshire, Brecknockshire, and part of Cardiganshire, the population amounts to 918,802.

If the population of the city and county of Dublin, and the four counties immediately contiguous to Dublin; viz. Longford, East and West Meath, and Wicklow, be added to this, as it fairly may be, in considering the extent of public benefit to be derived from the railway, it makes a total of 1,853,968; an amount of population which bears a much greater proportion to the length of the railway, than the total population of the rest of England and Wales bears to the total length of the railways already made or in progress, and exclusive of several lines now projected, and which must be made; or in other words, that the population to be affected by the railway is greater per mile on this line than the average of the other English railways.

Note.—The total population of England and Wales being taken at 14,000,000, and deducting 918,800, leaves 13,081,198, which, divided by 1,950. the length in miles of the other railways, gives 6,708 as the average population per mile, while for the proposed line of 208 miles there is a population of 9,000 per mile.

I cannot conclude my observations without again drawing your attention to the very unfavourable circumstances under which the present line has been brought under your consideration; and regarding it as one of not a mere local, but of great national importance, I earnestly solicit you to give the measure (particularly in comparison with others) the full benefit of all those alterations and improvements which, from your inspection of the country and knowledge of the subject, you would advise to be made; and if the advantages of the proposed line should be considered by you sufficient to merit further investigation, I have no doubt that such improvements may be made as will ensure its selection as the means of affording the shortest and quickest line of communication between Dublin and London.

I have, &c.

(signed) *J. K. Brunel.*

REPORT from Rear-Admiral Sir *James A. Gordon* and Captain *Beechey* to the Lords of the Admiralty, relative to the best Means of communicating between *London* and *Dublin*, and the relative Capabilities of the Ports of *Holyhead*, *Ormes Bay*, and *Porthdynllaen*.

Sir, Holyhead, 14 January 1840.

We have the honour to acquaint you that, in obedience to the directions of the Lords Commissioners of the Admiralty, conveyed to us in your letter of the 2d December 1839, desiring us to report upon the best means of communicating between London and Dublin, and more immediately upon the relative capability of the ports of Holyhead, Ormes Bay, and Porthdynllaen, for expediting and receiving the steam-packets to and from Dublin, we have proceeded to those places, and carefully examined into every circumstance bearing upon that question.

We have considered the respective distances of those places from Kingstown; the effect of tides and prevailing winds upon the passage, and every point which might affect the expeditious and certain transmission of the mails; the effect of races, prevalent swell, the form of the shore, and influence of adjacent mountains, with reference to the certainty of making the port, or to a ready and safe entry or departure of the packets therefrom at all hours of the day or night, as well as to the perfect and immediate security when in, and to the facility of landing or embarking their mails and passengers; the works which it would be necessary to construct at either of the above-mentioned places, and the probable expense that would attend their execution.

We have used all possible diligence in inquiring into all these matters; and we have the honour to acquaint you, for the information of their Lordships, that we are decidedly of opinion that both Ormes Bay and Porthdynllaen are under such great disadvantages, as compared with Holyhead, whether as regards the distance, the passage, the convenience as a station, or the expense of constructing works, that we have no hesitation in recommending Holyhead as the most fit and eligible point for the departure and arrival of the packets on the eastern side of the Channel.

In coming to this conclusion, we beg to state that the reasons which have mainly induced us to decide in favour of Holyhead, are based upon the superiority of the passage across the Channel from that place to Kingstown, as compared with the run between the last-mentioned place and either of the other ports; and as the merits of these passages may be deemed a most material part of our inquiry, we have dwelt upon them somewhat in detail, and beg to refer their Lordships to their discussion in page 41, under the head of "Remarks upon the Passages." We shall here merely observe that, duly impressed with the importance which attaches to the subject, we have given it our full and most deliberate consideration.

As regards the relative capability of the ports for the reception and accommodation of large steam-packets, or the construction of works suitable to a packet establishment, we have the honour to observe, that upon visiting the places specified in their Lordships' instructions, we found Ormes Bay and Porthdynllaen mere open roadsteads, and that the harbour of Holyhead was far too limited and shallow for the reception of large class steamers; so that at whichever place it might have been thought advisable to establish a station, it would have been necessary to construct a harbour purposely for their protection and accommodation.

Upon a careful examination of each of these places, by land and by sea, aided by the boats of the African, and the surveys recently executed by Captain Beechey, Commander Robinson, and Lieutenant Sherringham, we found that a better harbour could be constructed at Holyhead, and at a less expense, than at either of the other places. That from the nature of the coast about Holyhead, and the absence of rivers in its vicinity, a harbour formed there would not be likely to fill up[*]; whereas the other bays being faced by high precipitous cliffs of loose earth and sand, and washed daily by a long ebb charged with the sands of the Dee and Mersey in one case, and with the silt and sand of the Menai in the other, there would be great probability of any harbour constructed at either of them being rendered so shallow hy the enclosure of a space for that purpose, and by the obstruction of the current which now scours the bays, that it would shortly be available only for vessels of small draft of water. At Porthdynllaen, especially, we are of opinion that this would take place earlier, from the falling away of the range of cliffs of loose sand which overlook the bay, and rise precipitously from the high-water mark, to the height of 120 feet[†]; and that any harbour constructed in this bay would require these cliffs to be partly faced with masonry, to prevent the mischievous effects of this evil, all of which would add materially to the expense. Or if, in order to obviate this, it were proposed to build a breakwater, and allow the tide to rush through the anchorage and the sound, the harbour would be greatly inconvenienced by the current, and always subject to a heavy ground swell; and as the outer end of the breakwater would have to he carried into very deep water, and the stone for its formation to be water-borne, the expense of this fabric alone would far exceed that of all the contemplated works at Holyhead.

Porthdynllaen also is particularly deficient in accommodation for buildings of any description; and if at any period it should be required to combine with the packet station an establishment for effecting the repairs of the packets and their machinery, which it is extremely desirable to do, it could not be conveniently done at Porthdynllaen, as the buildings there would either have to be erected upon the beach at high-water mark, and the sea to be walled out, or be perched upon cliffs of sand 120 feet above it, and all the heavy work of the yard to be carried up and down the face of the cliff along inclined roads.

In accommodation of this nature, Holyhead is so pre-eminently superior to either of the other places, that it is only necessary to allude to the Government establishment already there, and the ample space of Crown land adjoining the yard, for the extension of these works, if it should hereafter be thought advisable, either from the increase of the packet establishment, or the exigencies of a war; and there is also a capacious dock at Holyhead, for the reception of the packets, whenever their copper may require to be examined, or their bottoms repaired. But above all, we must not omit to notice the great advantage which would be derived from the present harbour, which, although too confined for large steamers, would form a distinct and most acceptable asylum for the numerous coasters, sometimes amounting to upwards of 50[‡] at a time, which continually seek shelter from gales and adverse winds, and thus rid the packet port at Holyhead of an inconvenience which, unless provided against, would be seriously felt at either of the other stations; a consideration of much importance, both as it may affect the accommodation of the packets, or the size and expense of the works to be undertaken.

All these advantages in favour of any particular spot are, we admit, of minor importance compared with the expeditious dispatch of the mails across the Channel; and we have to assure their Lordships that we should not have bestowed a moment's time upon them had not the great object of our inquiry been decidedly in favour of the place possessing these advantages.

Having come to the conclusion that Holyhead is in every respect the most fit and eligible situation for a packet station, in connexion with that of Kingstown, and stated it as our opinion that it will be requisite to construct a new harbour at the first-mentioned place, for the reception of large class steamers, we proceed to observe that we have seriously weighed and considered this matter, and have the honour to transmit to their Lordships a plan, in which the proposed works are delineated.

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[*] As a proof of this, the workmen employed in the diving bell in 1831, in setting the stones round the foundation of the outer part of the Northern Pier, found several railway plates, a hand-mason's hammer, and other tools which had been lost overboard in setting the foundation under the lighthouse in 1817. These implements were found lying upon the bottom, not at all buried in sand or silt.

[†] Taken from Lieutenant Sherringham's plan.

[‡] See the Report of Mr. Evans, Harbour-master.

By that plan, it will be seen, that we propose to extend the present pier about 800 feet in a north-easterly direction, and to face it on the northern side, and render it in every way convenient for the packets steaming alongside it to receive and land their mails and passengers, and to project a rubble pier from the northern extremity of Salt Island, so as to enclose about a square quarter of a mile of water, varying in depth from about 16 to 24 feet, at low-water spring-tides. There will thus be left an opening of 450 feet between the pier heads, upon the northern one of which it will be necessary to place a lighthouse; and as we have ascertained that the present one, which will then be no longer required, can be readily taken down and re-erected, we submit the propriety of its removal to that place.

In prescribing limits to this port, we have assumed that the establishment of packets will consist of six steamers, of the class of the Merlin and Medusa, and have placed the piers with reference to this number, and the space in which a vessel of this class can conveniently come round under steam, in order to take up her berth.

We have thus limited the size of the proposed barbour to what we consider essential to the use of the packets; but it is evident that, as soon as it is known that there is a port upon the coast capable of receiving ships of burthen, it will be resorted to by the passing trade during gales and adverse winds; and as it will be impossible to deny access to these vessels, it appears to us to be proper to mention the circumstance, in order that a suitable extension of the proposed pier may be taken into consideration previously to the commencement of any of the works.

We have ascertained that stone may be had at a convenient distance from the port, and may be readily conveyed thither by railroad, and we have computed the probable expense of all the works which will be required to complete this harbour at about 200,000 *l.*, allowing 3*s.* per cubic yard for the rubble pier, and 4*s.* per cubic yard of stone, which may be considered a covering price.

We have, &c.
(signed) *James A. Gordon*,
Rear-Admiral.

More O'Ferrall, Esq. &c. &c. &c.
Admiralty.

F. W. Beechey,
Captain.

Referred to in page 39 of Letter.

REMARKS upon the PASSAGES between *Kingstown* and *Holyhead, Porthdynllaen* and *Ormes Bay.*

The respective distances between these places are :—

From Kingstown to Holyhead	- -	54 geographical miles.
— Porthdynllaen	- -	60 —
— Ormes Bay	- -	84½ —

But as the packets from Porthdynllaen, will have to round the Kish light vessel, it will be proper to reckon the distance from that spot, in order to draw a just comparison.

From the Kish to Holyhead Bay	- -	48 geographical miles.
— Porthdynllaen	- -	54 —
— Ormes Bay	- -	78½ —

From this it appears that Ormes Bay is 30 miles further from the Kish, and consequently full three hours of time more distant from that spot than Holyhead; and as the packet, for about four days in every fortnight, would, during the first part of her passage, have to stem a tide running from two to three and a half knots per hour, this distance would occasionally be increased to 36 or 40 miles, or very nearly four hours of time, even in moderate weather.

This great excess of distance by sea, between the Kish and Ormes Bay, over that between the Kish and either of the other ports, is quite sufficient, in our opinions, to put Ormes Bay wholly out of the question, as a packet station, whilst there is a possibility of either of the other places becoming one; we shall, therefore, limit our observations to the relative merits of the other two passages.

It is shown above, that Porthdynllaen is six miles further from the Kish, than Holyhead; and as in thick or hazy weather, it will be necessary to give a wide berth to the Kish and Bray banks, to compensate for the errors to which so long a route is liable, from steerage, lee-way, and the irregularity of the tides, this distance will occasionally be so much increased, that we shall not err far in giving the number of miles 8 or 10 more than that between Holyhead and the Kish. It is to be observed, with respect to the Holyhead route, that there is no necessity for this precaution, as the course of the vessel is at right angles to the danger, and an error in the direction, arising from either of the abovementioned causes, does not bring the vessel into peril until she has arrived within a mile of her true distance, as may be seen by the diagram which accompanies this Report.

See Diagram, Plate 2.

To show more clearly the necessity there is on the Porthdynllaen route of giving a wide berth to the dangers which skirt the Irish coast, and which lie directly in the route from Porthdynllaen to Kingstown, there is traced upon the diagram the effect of an error of a point in the course from both Holyhead and Porthdynllaen; upon the Holyhead line, it will be seen that this error will not endanger the vessel until she has arrived within a mile of her supposed distance from the Kish; whereas, the same error upon the Porthdynllaen line will put the vessel upon the sands before she has run within nine miles of her proper distance; and as this deviation from the supposed conrse may happen during bad weather, from steerage, lee-way, or influence of the tides, without any neglect of the officer in command of the packet, it will be absolutely necessary to guard against such a possibility by keeping well to the northward, and making a circuit which will considerably increase the distance to be finally run.

The tides also operate more unfavourably upon the Porthdynllaen line than upon the other; a whole ebb or flood upon the Holyhead passage increases the distance to the Kish about one mile only, whilst upon the Porthdynllaen passage the flood shortens the distance about two miles, and the ebb lengthens it five, making the distance from Porthdynllaen to the Kish, under such circumstances, 10 or 12 miles more than from Holyhead to the Kish, and about 13 or 14 miles more by observing the necessary precaution before mentioned, of giving a prudent berth to the said banks.

This effect of the tides upon the distance to be run on dark and hazy nights, when the lights cannot be seen far, and when an officer has nothing to guide him but his distances and his soundings, will render extreme caution necessary on aproaching the danger, especially when it is known that a slight error in the course, as has before been shown, will place the vessel among the breakers before she has run four-fifths of her distance, and will, in fact, ever deny to this route the confidence which has long been established and is so fully warranted upon the Holyhead line.

The extreme accuracy with which the distance may be run between Holyhead and the Kish, will be seen in Table 1 A, which contains a register of 22 tracks to and from the Kish and Platters in Holyhead, run by the Doterel, with the African's patent log; the second and fifth columns (Table 1 B) contain these distances corrected for the known set of the tide according to the time of high water between the Platters and the vicinity of the Stack, where alone this route is liable to disturbance, and an inspection of these two columns will show that out of 22 trials, there is but one by which the distance shown by the log erred a mile from the true distance between the two places, and that the other 21 trials are within a quarter of a mile of the truth.

With regard to the races and swell on either of these tracks, we consider them to operate equally on both lines, except that we have always understood that a heavier swell from the S.W. and N.W. tumbles into Caernarvon Bay, than is felt in other parts of the Channel, and that the race off the Stack need be avoided only at the springs, when the tides are running in an opposite direction to a strong wind.

We cannot discover, from the data we have collected, that the prevailing wind is more favourable to one route than the other.

Table 2, abstracted from the African's log, shows the number of hours the wind prevailed in each point of the compass during 12 months, in which she was surveying between Dublin and Holyhead; and Table 3, abstracted from a year's log of the double line of Holyhead packets, shows the number of days throughout the year on which the wind was on each point of the compass.

Both Holyhead and Porthdynllaen are particularly conspicuous, from the remarkable mountains in their vicinity; but from some cause, probably from their increased elevation and vicinity to the great Caernarvon range, the Rivels and the other hills about Porthdynllaen are seldom to be seen with southerly and westerly winds, whereas Holyhead is scarcely ever obscured.

There is another rather important advantage upon the Holyhead route. In running for the bay in hazy weather, there are three lighthouses within six miles of each other; the Stack on the south, the Skerries on the north, and the Pier Light in the centre of the bay, so that it can hardly happen that a vessel will ever be at a loss to know her position; but in running into Caernarvon Bay the route from the Kish to Porthdynllaen passes the Stack 17 miles on the north and the Bardsey 14 miles on the south; besides which, the Bardsey is shut in several miles before a vessel approaches the coast about Porthdynllaen.

We come lastly to the form of the shore, and, as immediately connected with that question, the confidence which an officer feels in running for his port.

Holyhead, from its prominent situation in the Channel, and without any dangers about it, may be run for at any time with the greatest safety; and if, by chance, it should be passed unseen, a vessel, upon discovering her error, has room to haul up north or south, as the case may be; and if the gale blows too hard for her to steam against it, she may set her sails and carry off; whereas Porthdynllaen is situated in a bay upon a long extent of coast, which, with northward gales, form a most dangerous lee-shore upon which the sea heaves in furiously, from the contrary tides along it, and the prevailing in-shore stream running against the prevailing wind. With a gale blowing upon this shore it is necessary to observe the utmost caution in approaching it, and to be quite certain of making the port (supposing one to be formed there), for in the event of missing it, and in a vessel that could not steam against the gale, inevitable destruction would await her. Although such a contingency as this does not, by any means, constitute an insuperable objection to the Porthdynllaen route, yet it, nevertheless, appears to us to be a substantial reason for refusing to bestow upon it a choice, when no such necessity exists. Liverpool and other places, at times, unquestionably form as dangerous a lee-shore as Porthdynllaen; but the consequence of this is, that the packets frequently ease their engines to lie to till daylight, a delay scarcely ever known upon the Holyhead line.

The letters of the officers now employed upon this station, and of Lieutenant Davies who was 14 years in command of one of the packets, and copies of which are annexed to this Report, will show the confidence they have always felt in running for Holyhead under the most difficult circumstances, and the necessity there is for this feeling in order to insure the requisite dispatch of the mails. If this cannot be established,—if a vessel, by a slight error in the course, is liable to be stranded upon sands before she has run four-fifths of her distance,—or if there is any doubt of making her port and of saving the vessel in the event of her missing it,—the transmission of the mails will be rendered uncertain, and, in fact, their delivery will be affected by every gale that blows.

From this minute investigation of the question of the passages, we have been so strongly impressed with the advantages of the Holyhead line, that we have, at the commencement of our Report, ventured to speak warmly in its favour; and we think, that when large and fast steamers are put upon this station, that the mails will not only be remarkable for the regularity of their delivery, but the average length of the passage across the Channel will be reduced to five hours and a quarter.

(signed) *James A. Gordon*, Rear-Admiral.
F. W. Beechey, Captain.

Holyhead,
14 January 1840.

No. 1 A.

A TABLE showing the Distance run by Patent Log between *Platters* Buoy, *Kingstown* Pierhead, and the *Kish* Light Ship.

DATE.	Log put over set at	TIME.	Log hauled in at	TIME.	Distance shown by Log			Time at Platters or Kingstown.	Time of High Water.
					At Kish	At Kingstown.	At Platters.		
1839:		H. M.		H. M.				H. M.	H. M.
June 4 & 5 -	Kingstown -	8 43 p.m.	Kish -	9 25 p.m.	6 5	- - -	52 5	2 24 a.m.	3 58 p.m.
— 6 -	Platters -	6 54 a.m.	Kish -	11 45 a.m.	45 4	51 5½	- - -	0 25 p.m.	6 20 a.m.
— 7 -	Kingstown -	7 38 a.m.	Kish -	8 36 a.m.	6 5	- - -	51 1	2 39 p.m.	6 23 a.m.
— 8 & 9 -	Platters -	6 58 p.m.	Kingstown	- - -	- - -	52 1	- - -	0 54 a.m.	8 0 p.m.
— 9 & 10 -	Kingstown -	8 44 p.m.	Kish -	9 30 p.m.	6 7½	- - -	53 7	2 52 a.m.	9 1 p.m.
— 11 -	Platters -	7 3 a.m.	Kish -	0 44 p.m.	47 6	54 2½	- - -	1 35 p.m.	10 23 a.m.
— 12 -	Kingstown -	7 40 a.m.	Kish -	8 24 a.m.	6 4½	- - -	56 5	1 54 p.m.	11 12 a.m.
— 13 & 14 -	Platters -	7 8 p.m.	Kingstown	- - -	- - -	55 5	- - -	1 15 a.m.	— p.m.
— 14 -	Kingstown -	7 43 a.m.	Kish -	8 33 a.m.	6 6	- - -	56 8½	2 53 p.m.	0 40 p.m.
— 15 & 16 -	Platters -	7 11 p.m.	Kish -	0 20 a.m.	47 6	54 1	- - -	1 2 a.m.	1 28 p.m.
— 16 & 17 -	Kingstown -	8 46 p.m.	Kish -	9 28 p.m.	6 6	- - -	55 7½	2 41 a.m.	2 50 a.m.
— 18 -	Platters -	8 35 a.m.	Kish -	0 32 p.m.	46 7½	53 3½	- - -	1 14 p.m.	3 40 a.m.
— 19 -	Kingstown -	8 11 a.m.	Kish -	8 53 a.m.	6 7	- - -	53 6¾	1 50 p.m.	4 31 a.m.
— 20 & 21 -	Platters -	7 7 p.m.	Kingstown	- - -	- - -	53 5¾	- - -	0 50 a.m.	5 50 p.m.
— 22 -	Kingstown -	8 13 a.m.	Kish -	9 9 a.m.	6 7¼	- - -	50 6¼	2 23 p.m.	7 16 a.m.
— 23 & 24 -	Platters -	6 41 p.m.	Kingstown	- - -	- - -	52 8½	- - -	1 15 a.m.	8 40 p.m.
— 25 -	Kingstown -	8 11 a.m.	Kish -	8 54 a.m.	6 7½	- - -	56 0½	2 16 p.m.	9 50 a.m.
— 26 & 27 -	Platters -	6 38 p.m.	Kingstown	- - -	- - -	56	- - -	1 2 a.m.	10 55 p.m.
— 28 -	Kingstown -	8 19 a.m.	Kish -	9 2 a.m.	6 5	- - -	56 3	2 30 p.m.	11 49 a.m.
— 29 & 30 -	Platters -	6 43 p.m.	Kish -	0 10 a.m.	48 6	55 5	- - -	0 54 a.m.	0 22 p.m.
July 2 & 3 -	Platters -	6 43 p.m.	- - -	- - -	- - -	50 9½	- - -	0 29 a.m.	2 37 p.m.
— 4 -	Kingstown -	8 14 a.m.	Kish -	8 57 a.m.	6 6½	- - -	53 3½	1 59 p.m.	4 1 a.m.
					6 62	53 61	54 41 53 61	Mean.	
							54 01 53 9	Mean to and fro. True distance.	
							0 11	Difference.	

True Distance:

Platters to Kish - - - - - - - - - - - - - 47 4
Kish to Kingstown - - - - - - - - - - - - 6 5
53 9

No. 1 B.

ABSTRACT of the foregoing Table.

Holyhead to Kingstown.			Kingstown to Holyhead.		
Distance run.	Corrected Distance.	REMARKS.	Distance run.	Corrected Distance.	REMARKS.
51 3	53 5	A whole ebb with her; neaps.	52 5	53 5	Four hours' flood with her.
52 1	54 0	Four hours' ebb with her.	51 1	53 3	Four hours' flood near Holyhead.
54 2	54 2	- - Tide in Holyhead Bay favourable and offing against.	53 7	53 7	Nothing remarkable.
55 5	53 5	Five hours' flood against her.	56 5	53 5	Four hours' flood; two hours' ebb near Stack.
54 1	54 1	Dead low water.	56 8	53 8	- - Five hours' flood, but two and a quarter hours' ebb near bay.
53 3	53 3	Tide favourable in the bay.	55 7	53 7	Flood in favour; eddy strong out of bay.
53 5	53 5	Ebb against her, but meets first flood.	53 7	53 7	Nothing of consequence.
52 8	53 8	Tide favourable in bay.	50 6	52 6	An hour's first of flood into Holyhead.
56 0	54 0	Four hours' flood, spring against.	56 0	54 0	Five last hours' ebb against her, springs.
55 5	53 5	Whole flood against her; springs.	56 3	53 8	Three hours' ebb against her, spring.
50 9½	53 4	Took half ebb out of bay.	53 3	53 3	- - Last four hours' flood with her, but slack water in the bay.

The exact distance from Kingstown Pier to the Platters Buoy, Holyhead, is 53.9 miles, and by allowing a fair correction for the influence of the tides, from a knowledge of the time of high-water on the given day, and the direction and velocity of the tide, it appears that the log was never more than half a mile out, except upon one occasion, and then it was 1–3 short.

No. 2.

Points of the Compass.	January and Feb. combined.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Number of Hours from each Point for 365 Days.	Foul for Holyhead.	Foul for Porthdyn-llaen.	REMARKS.
	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	
North	34	16	12	100	53	80	118	27	58	7	5	520	–	520	—
N. by E.	–	–	–	–	–	–	–	–	–	–	–	—	–	–	—
N.N.E.	12	16	4	66	–	9	17	7	2	–	5	138	–	–	Fair for both.
N.E. by N.	–	–	5	1	–	–	–	–	–	–	–	6	–	–	- ditto.
N.E.	30	70	2	48	3	24	13	24	8	5	24	251	–	–	- ditto.
N.E. by E.	–	–	–	6	–	–	–	–	–	22	–	28	–	–	- ditto.
E.N.E.	60	36	2	28	15	–	9	3	–	15	–	168	168	–	—
E. by N.	4	–	3	3	15	–	–	–	–	–	–	25	–	–	Foul for both.
East	16	–	12	38	64	20	9	–	30	23	2	214	–	–	- ditto.
E. by S.	4	60	18	–	7	–	–	–	–	–	–	89	–	–	- ditto.
E.S.E.	4	12	11	17	2	23	–	–	51	60	4	184	–	–	- ditto.
S.E. by E.	8	–	–	–	–	–	–	–	24	–	–	32	–	–	- ditto.
S.E.	20	20	67	14	27	8	72	32	46	132	16	454	–	–	- ditto.
S.E. by S.	–	–	23	13	–	–	–	–	–	–	–	36	–	–	- ditto.
S.S.E.	4	14	89	7	6	10	14	–	4	23	–	171	–	–	- ditto.
S. by E.	11	–	–	–	–	–	–	3	–	–	–	14	–	–	- ditto.
South	32	154	25	3	41	81	22	35	73	25	41	532	–	532	—
S. by W.	20	21	–	3	3	–	8	–	11	11	22	99	–	99	—
S.S.W.	71	12	47	5	65	27	32	10	58	20	64	461	–	–	Fair for both.
S.W. by S.	–	–	–	–	–	4	–	–	–	–	9	13	–	–	- ditto.
S.W.	125	59	10	60	58	59	142	211	134	57	114	1,029	–	–	- ditto.
S.W. by W.	8	–	–	–	8	–	–	–	–	–	13	29	–	–	- ditto.
W.S.W.	116	55	2	5	36	65	78	108	24	4	37	530	530	–	—
W. by S.	40	–	1	–	–	–	–	5	–	–	–	46	46	–	—
West	128	45	8	4	59	41	29	92	30	–	25	461	–	–	Foul for both.
W. by N.	49	2	11	2	5	38	–	12	–	–	–	119	–	–	- ditto.
W.N.W.	217	27	96	22	–	29	42	24	4	12	52	525	–	–	- ditto.
N.W. by W.	7	9	4	–	–	5	–	–	–	–	–	25	–	–	- ditto.
N.W.	185	39	108	88	20	40	45	20	31	67	158	801	–	–	- ditto.
N.W. by N.	22	6	–	3	–	–	–	–	–	–	3	34	–	–	- ditto.
N.N.W.	77	12	16	61	76	28	14	4	24	4	9	325	–	–	- ditto.
N. by W.	–	–	–	–	–	–	6	–	–	25	3	62	–	–	- ditto.
Calm	13	38	45	44	63	41	23	33	30	39	52	421	–	–	—
												7,842 8,544 =	744 356 days.	1,151 744	
												702	Vble.	407	- - In favour of Holyhead.

N. B.—Nine days of November are not registered.

No. 3.

Points of the Compass	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for each Month	Foul for Holyhead.	Foul for Porthdyn-llaen.	REMARKS.
North	1	–	5	5	4	3	5	1	2	5	6	1	38	–	38	—
N. by E.	–	–	1	–	1	–	1	–	–	–	–	–	3	–	3	—
N.N.E.	–	1	3	10	5	5	9	5	2	6	4	1	51	–	–	- - Fair for both passages.
N.E. by N.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
N.E.	–	2	7	13	8	4	2	4	10	9	2	4	65	–	–	Fair for both.
N.E. by E.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—
E.N.E.	2	2	1	2	8	–	–	–	3	3	2	2	25	25	–	—
E. by N.	–	–	–	–	3	1	–	–	–	1	–	–	5	–	–	Foul for both.
East	7	8	2	4	12	2	1	1	1	5	4	1	48	–	–	- ditto.
E. by S.	1	1	1	–	3	–	–	–	1	3	–	–	10	–	–	- ditto.
E.S.E.	25	29	5	2	10	1	3	1	4	3	5	4	92	–	–	- ditto.
S.E. by E.	–	2	–	–	–	–	–	–	–	–	–	–	2	–	–	- ditto.
S.E.	9	14	4	–	4	1	2	–	2	1	8	1	46	–	–	- ditto.
S.E. by S.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	- ditto.
S.S.E.	8	6	1	1	3	6	2	2	–	–	2	3	34	–	–	- ditto.
S. by E.	1	–	1	–	–	–	1	–	–	–	3	–	6	–	–	- ditto
South	12	12	6	3	5	8	10	2	7	1	5	1	72	–	72	—
S. by W.	–	–	–	–	–	–	–	–	–	–	–	2	2	–	2	—
S.S.W.	20	5	10	6	6	16	12	11	14	10	6	16	132	–	–	Fair for both.
S.W. by S.	–	–	–	–	–	–	–	–	–	–	–	2	3	–	–	- ditto.
S.W.	9	5	9	6	–	20	15	21	22	7	9	21	134	–	–	- ditto.
S.W. by W.	1	–	–	–	–	–	–	2	–	–	–	–	3	–	–	- ditto.
W.S.W.	3	4	5	6	–	7	3	12	4	11	2	6	63	63	–	—
W. by S.	–	–	–	–	–	–	–	–	1	–	1	–	2	2	–	—
West	4	2	4	6	1	7	6	8	4	4	4	5	55	–	–	Foul for both.
W. by N.	1	–	2	1	–	1	–	2	–	2	1	1	11	–	–	- ditto.
W.N.W.	1	6	16	16	8	7	16	19	8	18	16	18	149	–	–	- ditto.
N.W. by W.	–	–	2	1	–	1	–	–	–	–	–	–	4	–	–	- ditto.
N.W.	4	3	10	13	11	7	10	12	8	14	9	20	121	–	–	- ditto.
N.W. by N.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	- ditto.
N.N.W.	–	–	3	6	–	1	4	3	2	4	3	4	30	–	–	- ditto.
N. by W.	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	- ditto.
Calm } Variable }	Not considered.															
														90	115 90	
															25	- - In favour of Holyhead.

Sir, Kingstown, near Dublin, 20 December 1839.

I HAVE the honour to acknowledge the receipt of a letter from yourself and Captain Beechey, dated on yesterday, requesting my opinion of the comparative merits of the passages between this place and Ormes Bay, Holyhead, and Porthdynllaen, together with other points connected with those harbours as a mail-packet station; to which I hasten to reply. I consider the promontory of Holyhead to be admirably situated for the purpose of a station for the Kingstown packets; being high and of remarkable shape, it is seen and recognized in clear weather from the deck of an ordinary packet at a distance of 10 leagues. In such weather the land at one or other side of the Channel may be seen distinctly from the vessel during the whole of the passage, a material point towards observing the effect of the current on the course of the vessel, and thereby shortening the passage. The distances between the several places and Kingstown are as follows:—

	Nautical miles.
From Holyhead to Kingstown - - - - - - -	60
Porthdynllaen - - - - - - - -	68
Ormes Bay - - - - - - - -	93

Now, the average speed of the Holyhead packets has been of late eight knots; I mean, taking the passages made good in all weathers and under all conditions of tide, &c. during a year. Their speed in heavy contrary gales has been rather more than three knots; making such passages in from 17 to 20 hours. It will he readily seen, therefore, that had the point of departure been Ormes Bay or Porthdynllaen, the passages would have stood thus:—

	Year's Average.	
	H.	M.
From Ormes Bay - - - - - - - -	11	37½
Porthdynllaen - - - - - - -	8	30
Holyhead - - - - - - - -	7	30
Ormes Bay in contrary gales - - - - -	31	10
Porthdynllaen - - - - - - -	22	22½
Holyhead - - - - - - - -	20	0

In the above estimate I have only calculated the increase of the duration of the passages from Ormes Bay and Porthdynllaen according to the difference of the distance; but the fact is, that the difference in the length of the passage would be more than the common ratio, inasmuch as on the shortest passage the packet would proportionably sooner reach the shelter of the weather shore, and so by increasing her actual speed increase the average speed of the whole passage.

Very short passages have been made when the tides have been favourable; passages from starting to stopping in 5h. 15m.; but as Ormes Bay and Porthdynllaen lie in a bight, these tides would take a vessel more at an angle than they do on the Holyhead passage, and consequently these rapid runs could not take place.

With respect to the prevalence of wind from one quarter more than other, I think it may be fairly set down as blowing as frequently from the south side of west as from the north, and no more; and taking west as the medium point, Holyhead is situated so as to allow of advantage being taken either way. The proposed localities of Ormes Bay and Porthdynllaen, besides being further from Kingstown than Holyhead, are situated in deep bays, for which no seaman would think of running, even in a steamer, in heavy weather, blowing towards the shore; indeed several instances have occurred within my experience, in which, had the packets sailed from either of these bights, she must have gone on shore; while the packet from Kingstown would certainly not have attempted to run into a recess on a lee-shore, from which, in case of missing the exact port, there would be no escape from destruction. I may name three days, that are in my memory at this moment; and I shall be joined, I am sure, by every practical seaman who was out in these gales, in saying, that on the 23d of January 1837, the 29th November 1838, and 7th January 1839, no vessel in the world could have got in or out of a harbour down in these bays. No such danger or difficulty existed at Holyhead.

From the insulated position of Holyhead, it is much less subject to fogs than either of the places named on the main land; and even when these do occur, the soundings into the bay are so regular, and the coast so bold, and free from sands or rocks, that in 14 years' experience of it, I have never hesitated to run in by the lead on the darkest nights or days; and, I am happy to say, in all that time never once touched the ground.

The situation of the two lights are all that can be desired: the South Stack and the Skerries, being about six miles apart, one at each horn of the bay, are the most complete guides.

The tide from the North Stack to the harbour (close in shore) runs out nine hours of the twelve, and are slack on the flood the remaining three, while a mile out in the bay the tides take their regular course of flood or ebb; so that a steamer may generally take advantage of a favouring eddy.

With reference to the "Race of the Head," as it is termed, I have only to say, that it is at times inconvenient to vessels, but no seaman need or would go through it in violent weather; there is always, in the worst times, a clear space between that and the Race of the Skerries, through which a vessel may pass in safety.

An inspection of the chart will convince any impartial landsman of the great superiority of Holyhead as a station; but those seamen who have known the Irish Channel as long as I have, will have no difficulty in asserting that it is, under every consideration, the best point between the Mull of Galloway and Fishguard for a harbour of communication with Ireland; but, taking Dublin as the place to be reached, it is beyond comparison the best.

Having thus far complied with the request conveyed in your letter, I have only to add, that I shall have much pleasure in replying, to the best of my ability, to any further questions.

I have, &c.
(signed) *Geo. E. Davis.*
Lieut. R.N.

Rear-Admiral Sir J. A. Gordon, K.C.B.
&c. &c. &c.
Holyhead.

Her Majesty's Steam-packet Otter,
Holyhead, 23 December 1839.

Gentlemen,

In obedience to your directions, to furnish you with my opinion on the comparative merits of the passages between Kingstown, Ireland, and Ormes Bay, Holyhead and Porthdynllaen, Wales, and such information as my experience, as a commander of one of Her Majesty's packets on this station, has enabled me to obtain, I have the honour to state, in my humble opinion, Holyhead is far superior to the other mentioned places, for the following reasons; viz.

It is easy of ingress and egress at all times of tide, and I may say, in all weathers; "The Head," forming a good leading mark into Holyhead Bay, is steep close to, and projecting far out, enables us to run with little risk in foggy weather; and in hazy weather, blowing strong, when the sea is heavy in the Channel, by keeping to the northward, we can judge pretty accurately of our position by the smoothness of the water, which is evident with all winds except those from the N.W. to N.E. on entering the bay, and even with those winds the difference is perceptible after passing the "Race."

In foggy weather also the appearances of the water in the race indicate our proximity to the shore. These circumstances, together with the excellent lights, South Stack Skerries, and Harbour, within the limits of eight miles, permit us to run with confidence for Holyhead, when it would be perilous to run for Porthdynllaen, situated as it is in a deep bay, where the leading marks are not so good; and should the harbour be missed, or a break-down occur in a gale of wind, destruction would inevitably follow. With regard to the set of tides, as they are particularly strong at the springs, they vary in degrees of strength at different points, which a judicious seaman may take advantage of. Porthdynllaen being to windward, with the prevailing winds on starting from, is more than counterbalanced by the return passage to Holyhead, with southerly winds, generally found to draw from the eastward, on the Welsh coast. Again, Porthdynllaen being in a direct line, seven miles more distant, is, from the necessity of making for the Kish Light, at least nine miles further than Holyhead; consequently, one hour's more steaming, on an average. All circumstances therefore, considered, I would, from the practical knowledge I possess of the coast, tides, &c. prevailing winds, infinitely prefer running, in gales of wind and thick weather, for Holyhead, to Porthdynllaen, or indeed any other port on the coast of North Wales; and I may fairly judge that the passage would be made with more regularity, safety, and expedition, to and from Kingston and Holyhead than from the abovementioned port. Not being much acquainted with Ormes Bay, I can only observe, that it being about four hours' longer sea voyage, would make the communication still more uncertain and dilatory.

I have, &c.
Rear-Admiral Sir James Gordon, K. C. B. (signed) *H. P. Jones,*
and Capt. W. Beechey, R. N. Lieut. commanding.

Her Majesty's Mail Steam-packet Zephyr,
Holyhead, 13 January 1840.

Gentlemen,

HAVING been called upon by you for my opinion on the following points, relative to the comparative merits of the passages between Kingstown, in Ireland, and Ormes Bay, Holyhead and Porthdynllaen, Wales, taking into consideration all the circumstances which may tend to expedite or retard the delivery of the mail, supposing it to be dispatched from either of the above-mentioned places; I beg to state that, during the two years I have belonged to the packet service here, I have never seen either Ormes Bay or Porthdynllaen, therefore am unable to give any other opinion of their merits than their position on the chart, which appears to me to be infinitely inferior, in every way, to Holyhead.

As the shortest voyage is most desirable, Holyhead possesses the advantage over Ormes Bay of being 30 miles to windward, with the N. W. winds, which blow at times very hard, the prevalent winds varying from S. S. W. to W. S. W. enable the Holyhead packets to carry sail, as they get the true wind the moment they are out of the bay; whereas, if the wind is anything to the westward of S. W. off the Head, it is considerably more to the westward off Point Linas, therefore scant for a vessel coming from Ormes Bay, till she gets past the Skerries.

The ebb tide I consider to be as advantageous for Ormes Bay as Holyhead, setting right along shore till past the Skerries, then 'bout S. W. by W. when two or three miles outside; but with the flood and the wind anything scant from S. W., Holyhead would have infinitely the advantage both in wind and tide.

With regard to Porthdyllaen, during the N. W. gales, it is a dead lee-shore, on which the first of the ebb tide sets from the Head. Under such circumstances, I consider a vessel leaving Holyhead would be more than one third of the Channel over before a vessel leaving the former place would be much more than abreast of the Head.

With the flood tide, and the wind much to the westward of S. W., Porthdynllaen would have some little advantage, from being more to windward; but I think that would be counterbalanced by the greater distance (about nine miles), and the Kish Bank lying right in the way of making a straight course. In making the coast of Wales, the advantages Holyhead holds over the other two places are obvious; first, from its bold and forward position enabling me to run for it with the greatest confidence in any weather; secondly, at night, the breadth of the bay (seven miles across,) with a light on each side, and a leading one on the pier; all which enable a vessel to reach her destination with the utmost expedition.

As a proof of these advantages all the Liverpool steamers make the South Stack light before shaping their course to their port; and as the land about Porthdynllaen is covered with fog a great part of the year, I consider a vessel bound to that port would very often have to make Holyhead, and take a fresh departure.

I have, &c.
Rear-Admiral Sir J. A. Gordon, K. C. B. (signed) *James Smail,*
and Capt. T. W. Beechey, R. N. Lieutenant commanding.

Hull Packet Doterel,
Holyhead, 21 December 1839.

Sirs,

In obedience to your letter of the 19th instant, directing me to furnish you with my opinion as to the comparative merits of the passages between Kingstown and Ormes Bay, Holyhead and Porthdynllaen, I respectfully beg leave to state, that I have no local knowledge of either the former or latter places, having never been very near either of them; but from their situation on the coast, I should consider them as being very objectionable for packet stations.

A packet to or from Ormes Bay would not only have a much greater distance to run than to and from Holyhead, but from the set of the tides between the former place and the Skerries being in the same line on which the packets would have to steer, they would, at times, form a serious obstacle to the regular forwarding of the mails.

Porthdynllaen being situated in a deep bay, the approach to which, in consequence, I should consider extremely difficult and dangerous in thick weather, or with strong gales on the shore.

In my humble opinion, Holyhead is decidedly the most eligible situation on the Welsh coast for a packet communication with Kingstown, the passage being shorter than that of either of the others, and the set of the tides nearly at right angles with the packet's course.

The Head is extremely bold, and much more easily distinguished than any other land on the coast, with a light on each side of the entrance of the bay, making the approach to the harbour, at all times, and in every state of wind and weather, comparatively easy and safe; and it is equally favourable for the departure of the packets. I have been on this station upwards of 13 years, during which I have been detained with the mail in charge only six times, and then but a few hours at each, and not in a single instance for the last four years.

I am, &c.
(signed) *J. Grey*, commanding.

Rear-Admiral Sir James A. Gordon,
and Captain Beechey.

Her Majesty's Packet Sprightly,
Holyhead, Dec. 19, 1839.

Gentlemen.

I beg leave to acknowledge the receipt of your letter of this date, and in answer must inform you that I consider this port by far the more convenient for the speedy conveyance of the mails between the capitals of the sister kingdoms than either Ormes Head or Porthdynllaen, for reasons which I will further give. The prevailing winds during four-fifths of the year are from the S. W. to S.: these winds are much in favour of Holyhead, as the direct bearing by compass is W. N. W., or nearly so; consequently, the wind would be about a-beam: and from the experience I have had in steam vessels, I conceive it to be a wind in which they answer well. Now the distance, Holyhead and Kingstown Pier Head, is by chart 55 miles. Now the bearing of Kingstown from Porthdynllaen is N. W. ¼ N., which, if advantageous for the transmission of mails from England, would be disadvantageous in the other view of the case, without taking into account the distance, which is 62 miles, supposing a vessel to go to the northward of the Kish Bank, and in thick weather I should conceive it madness to venture among the banks between Bray Head and Wicklow, which are to the southward of the Kish. Competition between Ormes Head and Holyhead I should conceive to be entirely out of the question, from the well-known fact, that the wind from W. N. W. to N. N. W. and N., sends a heavy swell on to the shore between the Skerries and Ormes Head, rendering the passage not only tedious and slow, but likewise causing the anchorage along that coast dangerous and unsafe; the distance is moreover considerably more, being 83 miles.

As far as Holyhead is concerned, I can speak in its favour; but with respect to the other places, I would not venture to give an opinion, not being sufficiently acquainted with the localities; but the shore about Holyhead being bold and steep too, and soundings to be depended on, any person not even acquainted with the coast might, with very little experience, approach it at any time with confidence. Should you require any further explanation of my preferring Holyhead as a mail-packet station, on my return I will be prepared to give it; but having to proceed this evening to Kingstown,

I beg leave to remain, &c.
(signed) *James P. Moon.*

Rear-Admiral Sir James A. Gordon,
and Captain Beechey, R.N.

Harbour-office, Holyhead,
20 December 1839.

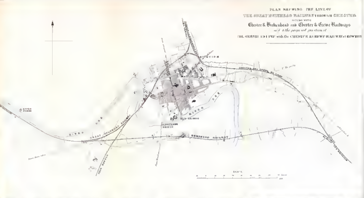
Sir,

HAVING received your letter of yesterday's date, stating that the Committee appointed to inquire into the communication by sea between Dublin and London, request I would state the number of vessels which have at any one time taken refuge in this harbour, and also the number which usually resort thither during adverse winds and tempestuous weather, I beg leave to inform you that there has been at one time in this harbour 198 sail of ships and vessels, exclusive of Her Majesty's packets; and with reference to a memorial, dated March 1826, addressed to Sir John T. Stanley, bart., as chairman of the local commissioners of Holyhead Harbour, pointing out the necessity of an additional place of shelter, and deeper water, signed by 44 masters in the foreign trade, and 57 in the Irish and coasting trade, several others refusing their signatures, on account of a passing rate being mentioned. The number then remaining in the harbour would be about 120 sail of ships and vessels.

During the last eight or ten years, the westerly gales have not been so heavy, nor continuing so long, as we experienced them the years before, the weather generally more moderate, and the wind more variable, that vessels are not detained in the harbour so long. The number of late generally in this harbour at one time, is about from 50 to 70 sail; still the number of vessels and their tonnage that took refuge here during the year 1838, were more than in the year 1836, viz., in the latter year 855 ships and vessels, tonnage 71,459. In the year 1838, the number of vessels were 1,076, and their tonnage 72,647.

I have, &c.
(signed) *Hugh Evans*,
Harbour-master.

Rear-Admiral Sir James A. Gordon,
&c. &c. &c.



PLAN SHEWING THE LINE OF
THE GREAT HOLYHEAD RAILWAY THROUGH CHESTER,
UNITING WITH
Chester & Birkenhead and Chester & Crewe Railways
and of the proposed junction of
THE HOLYHEAD LINE with the CHESTER & CREWE RAILWAY at ROWTON

Ordered by the House of Commons to be Printed, 23 April, 1849

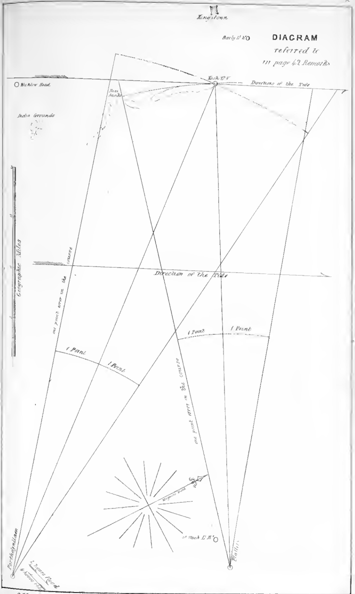
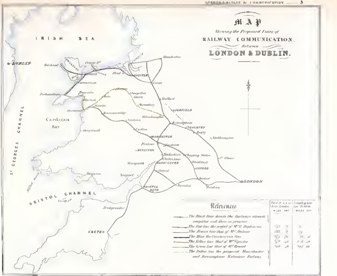


DIAGRAM
referred to
in page 42 Remarks

Ordered by the House of Commons to be Printed 15th April 1840

J Basire lith
James Luke G & Luke T Hansard Printers


MAP
Shewing the Proposed Lines of
RAILWAY COMMUNICATION
Between
LONDON & DUBLIN.
IRISH SEA
DUBLIN
Holyhead
ANGLESEY
Ormes Hd
BANGOR
Conway
Caernarvon
Flint
CHESTER
Liverpool
Manchester
Crewe
Porthdynllaen
Tremadoc
Harlech
Bala
Dolgelly
Llangollen
Chirk
Barmouth
Shrewsbury
Stafford
LICHFIELD
Machynlleth
Wolverhampton
Newtown
Birmingham
DAVENTRY
Rugby
Ludlow
Northampton
Cardigan
Bay
Aberystwith
ST GEORGES CHANNEL
WORCESTER
Pershore
Evesham
HEREFORD
Tewkesbury
Cheltenham
Chipping Norton
Woodstock
St Albans
Monmouth
GLOUCESTER
Stroud
OXFORD
Swansea
Newport
Didcot
LONDON
BRISTOL
BATH
Swindon
Reading
BRISTOL CHANNEL
Bridgewater
EXETER
References
The Black lines denote the Railways already completed and those in progress
The Red line the project of Mr G. Stephenson
The Brown line that of Mr Jenkins
The Blue the Caernarvon line
The Yellow line that of Mr Vignoles
The Green line that of Mr Brunel
The Dotted line the proposed Manchester and Birmingham Extension Railway
Total Distance from London
Length of new Line to form
MILES
CHS
MILES
CHS

LONDON AND DUBLIN, &c.
COMMUNICATION.

REPORTS to the LORDS of the TREASURY and ADMIRALTY, relative to the best Means of Communicating between *London* and *Dublin*.

(*Mr. Robert Gordon.*)

Ordered, by The House of Commons, *to be Printed*,
15 *April* 1840.

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